PROJECT MANUAL

A NEW 106 ROOM MARRIOTT COURTYARD

Woodbury, New York

for

Rainbow Hospitality

a+e architects, p.c.
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SECTION 00 00 01

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SECTION 00700

GENERAL CONDITIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specifications apply to this section.

1.02 AIA DOCUMENT A201 – 2007 EDITION

A. The latest edition of AIA Document A201, General Conditions of the Contract for Construction, is herein included as part of the Contract by reference.

1. Copies of AIA Document No. A201, General Conditions of the Contract for Construction, are available at the Architect's office or the local Chapter of The American Institute of Architects.
2. The Contractor shall obtain and use only an original copy of the AIA Document No. A201, General Conditions of the Contract for Construction.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 00700

SECTION 00800

SUPPLEMENTARY CONDITIONS

PART 1 – GENERAL

1.01 SUPPLEMENTAL CONDITIONS

A. The following supplements modify, change, delete from, or add to the "General Conditions of the Contract for Construction". AIA Document A201, Sixteenth Edition, 2007. Where any Article of the General Conditions is modified by any Paragraph, Subparagraph or clause hereof is modified or deleted by these Supplementary Conditions, the unaltered provisions of that Article. Paragraph Subparagraph, or Clause shall remain in effect.

ARTICLE 1

GENERAL PROVISIONS
1.1 BASIC DEFINITION

1.1.6 THE SPECIFICATIONS

1.1.6.1 The Specifications shall include exhibits that pertain to the Work as specified by the Owner included in this Project Manual and as noted in the Table of Contents.

ARTICLE 2

CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS

Add the following Subparagraphs 3.2.5, 3.2.6, 3.2.7:

3.2.4 On all drawings, figures take precedence over measurements by scale. Any scaling is done at the Contractor's own risk. The Architect will decide on questions that may arise regarding the meaning and intent of Drawing and Specifications. In the event the Contractor proceeds with the Work without requesting clarification of meaning or intent, the Contractor shall be responsible for the correction of the Work and will do so at his own expense.

3.2.5 Before ordering any material or doing any of the Work, the Contractor shall verify all measurements and shall be responsible for the correctness of same. Report any noticeable discrepancy to the Architect immediately for his consideration and decision. Check all parts of the Work and lay out in order that the contraction as a whole conforms to intent of Drawings.

3.2.6 Failure to examine the Project site and the Contract Documents, and to become familiar with existing conditions shall not constitute cause for compliant or claim for extra payment. Accept the Project Site as it exists. The site will be available to the Contractor upon receipt of the Architect's written Notice to Proceed. Care, Custody and control of the site or premises is vested in the Contractor during the term of Operations under the Contract, subject to rights of the Owner.

ARTICLE 9

PAYMENTS AND COMPLETION

9.3 APPLICATION FOR PAYMENT

Delete Subparagraph 9.3.1 in its entirety and substitute the following:

9.3.1 Applications for Payment shall be prepared only on AIA Document G702 "Application and Certificate for Payment" and AIA Documents G702A "Continuation Sheet". These forms will be available, upon request, from the Architect.

Until 50% Completion, the Owner will pay ninety percent (90%) of the amount due to the Contractor on account of progress payments, after which remaining partial payments shall be paid in full without reduction of the previous retainage. Payment will also be made in the amount of 75% for materials properly stored on site.

The Contractor shall be required to submit, with each payment request after the first payment, lien waivers covering the total amount previously paid. Lien waivers from Suppliers and Subcontractors shall clearly indicate exact dollar amounts as payment in full or shall contain a statement indicating a waiver of lien for all materials and/or labor furnished up to date of the lien waiver. The Contractor shall cover the difference for a given section with his own lien waiver to reflect his participation in the overall payment. The Contractor shall also submit a lien waiver on his behalf for the entire amount of the Draw Request.

9.3.2 Applications for Payment shall be made directly to the Owner’s Representative, by the 5th of the month for the previous month's work. Applications for Payment shall be reviewed by the Owner and the Architect in triplicate on or before the 15th of each month and payment made by the 20th. Any incomplete application or improper back-up will delay the payment process until the following month's application.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 00800

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Courtyard Hotel by Marriott

B. Project Location: Turner Road, Woodbury, New York

C. The Work consists of the following:

1. The Work includes construction of a free standing five-story hotel as designed, detailed, and specified in these contract documents.
2. Site preparation, site improvements and all utility services are designed and specified by others.

D. Project will be constructed under a single prime contract.

1.2 USE OF PREMISES

A. General: Contractor shall have full use of the space within construction limits for construction operations, and coordinate the use of project site with owner.

1.3 OWNER'S OCCUPANCY REQUIREMENTS

A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

END OF SECTION 011000

SECTION 012900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

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

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule and Contractor's Construction Schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the 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. Submit draft of AIA Document G703 Continuation Sheets.

2. 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.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

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. Payment Application Times: Progress payments shall be submitted to Architect by the 5th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month

D. Retainage: Until substantial completion, retainage from progress payments to the contractor shall be 10% of each payment until work is 50% complete, after which remaining partial payment shall be paid in full without reduction of the previous retainage. Payments will also be made in the amount of 75% for materials property stored on site.

E. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

F. Transmittal: Submit 1 signed and notarized copy of each Application for Payment in **PDF format** to Architect along with waivers of lien and similar attachments if required.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien in **PDF format** from every entity who is 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 final or full waivers.

H. Application for Payment at Substantial Completion: After issuing 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 Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: 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. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

3. AIA Document G706A, "Contractor's Affidavit of Release of Liens."

4. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 COORDINATION

A. 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 with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

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.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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.

9. Project closeout activities.

1.2 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data.

1.3 PROJECT MEETINGS

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

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. Review present and future needs of each entity present, including the following:
    a. Status of work
    b. Sequence of Operations
    c. Status of Submittals
    d. Long Lead Items.
    e. Contractors Construction Schedule.
    f. RFI's.
    g. Status of Proposed Requests.
    h. Status of Change Orders.
    i. Documentation of information for payment requests.
4. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including owner and architect, within three days of the meeting.

1.4 REQUESTS FOR INTERPRETATION (RFI's)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in PDF format..
1. RFI's shall originate with General Contractor. RFI's submitted by entities other than General Contractor will be returned with no response.
2. Coordinate and submit RFI's in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. 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 seven days if Contractor disagrees with response.

C. RFI Log: Prepare, maintain, and submit a tabular log of RFI's organized by the RFI number.

END OF SECTION 013100

SECTION 01 33 00

SUBMITTAL AND SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or reference to recognized industry standards.

2. To ensure that the specified products are furnished and installed in accordance with the design intent, procedures have been established for advance submittal of design data for its review and approval or rejection by the Architect

3. This Section specifies administrative and procedural requirements for submittals required for performance of the work, including:

a. Contractor's Progress Schedule

b. Shop Drawings, Product Data, and Samples

c. Letters of Conformance

d. Certificates

e. Manufacturer Installation Instructions

4. Substitution Procedures

5. Manuals

6. Miscellaneous Submittals

B. Related Documents:

1. Letter of Conformance Form

2. Contractor’s Substitution Request Form

C. Related Sections:

1. Contractual Requirements for Submittals: General Conditions

a. Two (2) copies of all Submittals, plus number of copies to be returned to Contractor, shall be submitted unless otherwise specified.

b. Provide additional copies as required for use in Project Record Documents.

2. Section 01 77 00 (01770) - Contract Closeout

3. Individual Submittals Required: Pertinent Sections of these Specifications.

1.02 SUBMITTALS

A. Coordination: Coordinate preparation and processing of Submittals with performance of construction activities. Transmit each Submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each Submittal with fabrication, purchasing, testing, delivery, other Submittals and related activities that require sequential activity.

2. Coordinate transmittal of different types of Submittals for related elements of the work so processing will not be delayed by the need to review Submittals concurrently for coordination.

    a. The Architect reserves the right to withhold action on a Submittal requiring coordination with other Submittals until related Submittals are received.

    b. No extension of Contract Time will be authorized because of failure to transmit Submittals to the Owner's Representative sufficiently in advance of the work to permit processing.

B. Deliver Submittals to the Architect

C. Submittal Preparation: Place a permanent label or title block on each Submittal for identification. Indicate the name of the entity that prepared each Submittal on the label or title block.

1. Provide a space approximately 10" x 10" on the label or beside the title block on Shop Drawings to record the Contractor's and Architect review and approval markings and the action taken.

2. Include the following information on the label for processing and recording action taken:

    a. Project Name

    b. Name of the Owner

    c. Date

    d. Name and Address of Architect

    e. Name and Address of Contractor

    f. Name and Address of Subcontractor or Vendor

    g. Location Where Item is to be Used

    h. Name of Manufacturer

    i. Drawing Number and Detail References, as Appropriate

    j. Certification by the Contractor

D. Submittal Transmittal: Package each Submittal appropriately for transmittal and handling. Transmit each Submittal from Contractor to [Architect]. Submittals received from sources other than the Contractor will be returned without action.

1. Transmit each submittal to the Architect with "AIA Document G810 - Transmittal Letter" and "Letter of Conformance".

2. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

3. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.

4. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

5. After Architect review of Submittal, revise and resubmit as required, identifying changes made since previous Submittal.

6. When re-submittal is required for any reason, transmit under new letter of transmittal, indicating by reference to a previous Submittal that this is a re-submittal.
    a. Identify on submittal all changes made since previous submission.
7. Distribute copies of reviewed Submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.
8. All Submittals shall bear the stamp of approval of the Contractor submitting same as evidence that they have been checked by him, or they will be rejected.
    a. Must be signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
9. Schedule submittals to expedite the Project and deliver to Architect. Coordinate submission of related items. Instruct parties to promptly report any inability to comply with provisions.



Note: Include paragraphs below for use with CFRST LEED Volume Program.

E. LEED Action Plans: Provide preliminary submittals within [14] [30] days of date established for the Notice to Proceed indicating how the following requirements will be met.
    1. General:
        a. Name of individual(s) on the Contractor's staff responsible for coordination of LEED prerequisites and credits, and submittal of all documents.
        b. Templates to be used for tracking LEED credits.
        c. Implementation plan for cumulative materials credits, which shall use applicable template with proposed materials, associated estimated costs, and details necessary for LEED calculation added in order to determine if the listed materials can be expected to achieve the Project goals. Submit cumulative materials implementation plans before materials purchasing begins.
    2. Credits MRc2.1 and 2.2: Construction Waste Management:
        a. Waste management plan complying with Section 01 74 19 "Construction Waste Management & Disposal."
    3. Credit MRc4.1 and 4.2: Recycled Content:
        a. List of proposed materials with recycled content.
            1) Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
    4. Credits EQc3.1 and 3.2: Construction IAQ Plan. Plan shall address the following points:
        a. HVAC Equipment Protection: Describe proposed measures for protecting the HVAC system during construction, including:
            1) Shut down of the return side of the HVAC system during heavy construction activities,
            2) Replacement of ventilation system filters at frequent intervals throughout the construction process.
            3) Protection of returns during disruptive construction activities.
        b. Pathway Interruption: Describe isolation methods, including, as applicable:

1) Temporary barriers.

2) Ventilating of construction areas directly to the outdoors if particularly dusty operations or installation of VOC-emitting materials are being performed.

c. Housekeeping: Provide a jobsite maintenance program that includes:

1) Storage and protection of building materials in a dry, clean location.

2) Implementing a no smoking policy for workers during construction.

3) Using HEPA vacuums for cleanup.

d. Two-Week Building Flushout.

e. Photographic Documentation.

F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Credits MRc2.1 and 2.2 – Construction Waste Management:

a. Construction Waste Management: Waste reduction progress reports complying with Section 01 74 19 "Construction Waste Management and Disposal."

2. Credit MRc4.1 and 4.2: Recycled Content.

3. Credit EQc3.1: Construction IAQ Management Plan:

a. Documentation of the SMACNA approach employed, indicating the implementation of IAQ management measures and complying with Section 01 81 19 “Indoor Air Quality Requirements.”

G. LEED Documentation Submittals: Submittals listed below are provided as a summary. Refer to individual Specification Sections for detailed requirements.

1. Credit SSc7.1: Heat Island Effect – Non-Roof:

a. Product Data for paving systems surfaces highlighting the reflectance of the installed materials.

2. Credit SSc7.2: Heat Island Effect – Roof:

a. Product Data for each roofing material that includes information demonstrating compliance with Energy Star and the Solar Reflectance Index (SRI) requirements. (Tested in accordance with ASTM E1980)

1) Roof Slopes less than or equal to 2:12: Equal to or greater than 78

2) Roof Slopes steeper than 2:12: Equal to or greater than 29

3. Credit WEc3.1: Water Use Reduction:

a. Product Data for all water consuming fixtures necessary for the occupancy use of the building, with flow rates highlighted.

b. Product Data for plumbing fixtures which do not consume water such as composting toilets or waterless urinals.

4. Prerequisite EAp2: Minimum Energy Performance:

a. Product Data or other documentation indicating that products comply with ASHRAE/IESNA 90.1.

5. Prerequisite EAp3: Fundamental Refrigerant Management:

a. Product Data for HVAC&R and Fire Suppression System Equipment indicating absence of CFC refrigerants.

6. Credit EAc1.1 and 1.2: Optimize Energy Performance:

a. Product Data for HVAC equipment indicating efficiencies.

b. Product Data for water heating system indicating efficiency.

c. Product Data for air barrier membranes indicating permeability performance.

d. Product Data for envelope insulation indication R-values.

e. Product Data for glazing indicating u-values, SHGC and Visible Light Transmittance values.

f. Product Data and Shop Drawings for automated lighting controls system.

1.03 PROGRESS SCHEDULES

A. Submit initial Construction Progress Schedule in duplicate within 14 days after date of Owner-Contractor Contract. Submit in the form required by the General Conditions of the Contract.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

Note: ***Letters of Conformance****:*

All paragraphs pertaining to Submittals in individual Specification Sections are to be edited to minimize the number of submittals required. This includes Shop Drawings, Product Data, and Samples.

By the use of the Letter of Conformance Article, Contractors are instructed to use the Letter of Conformance Form (Attached to the end of this Section) in lieu of submitting Shop Drawings, Product Data, and Samples, unless otherwise noted in a Specific Specification Section. The use of the "Letter of Conformance" should be encouraged by the Owner's Representative at the beginning of each Project.

If a "Letter of Conformance" is used, the Contractor will NOT be required to provide supporting documents or samples (unless otherwise noted in a Specific Specification Section, needed to supplement a submittal, or if requested by the Owner's Representative.)

1.04 LETTERS OF CONFORMANCE

A. Letter of Conformance: Short-form informational submittals which are to be used instead of shop drawings, product data and samples. They are also to be used to supplement shop drawings, product data and samples. A sample "Letter of Conformance" is located at the end of this Section. Use copies of this form for each submittal unless a more specific Letter of Conformance is located at the end of a particular Specification Section.

B. Within 30 days after date of Owner-Contractor Agreement, submit all Letters of Conformance indicating Contractor's selections for products proposed for use, with name of manufacturer, trade name, and model number of each product. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

C. Procedure:

1. Submit the number of copies which the Contractor requires, plus [two] copies which will be retained by the Architect

2. Submit completed Letter of Conformance for products selected as indicated within each Section.

3. Fill-in required information on form and sign in ink by person authorized to sign on behalf of the Contractor.

4. Clearly identify applicable products, characteristics, models, and options. Attach supplemental information including product data to each Letter of Conformance as necessary to communicate all information specific to the product.

5. No modifications to form permitted.

6. Letters of Conformance are not to be used for substitution requests.

D. By submitting a Letter of Conformance, Contractor declares that the product identified by manufacturer's name and model number:

1. Is one of the product(s) specified

2. Is suitable for the intended use as defined within the Contract Documents, and

3. Will be provided and placed in operational condition in accordance with the Contract Documents and manufacturer's published instructions.

1.05 SHOP DRAWINGS

A. Where Shop Drawings are required, submit newly prepared information drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

B. Shop Drawings shall be drawn at a scale to clearly indicate all of the above conditions and allow for corrections or modifications which the Architect may wish to make. The Architect shall be the sole judge as to the acceptability of manufacturer's literature and catalog sheets as Shop Drawings.

C. Shop Drawings shall clearly indicate all dimensional data for all parts of the item; types and materials for all connections; finishes; the exact relation of the item to adjacent materials and equipment in the completed structure including clearance, any necessary isolation, and fastening methods and devices; and mechanical and electrical connections.

D. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates, and similar Drawings. Include the following information:

1. Dimensions

2. Identification of Products and Materials Included

3. Compliance with Specified Standards

4. Notation of Coordination Requirements

5. Notation of Dimensions Established by Field Measurement

E. Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11", but no larger than 36" x 48".

F. Submit in the form of one reproducible transparency and one opaque reproduction, or three opaque reproductions plus required amount to be returned to Contractor. After review, reproduce and distribute to appropriate parties.

G. Do not permit Shop Drawing copies, without an appropriate final "Action" marking by the Architect, to be used in connection with the work.

H. The Contractors shall be responsible for distribution of additional prints to vendors, etc.

1.06 PRODUCT DATA

A. Where Product Data is required, collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

a. Manufacturer's Printed Recommendations

b. Compliance with Recognized Trade Association Standards

c. Compliance with Recognized Testing Agency Standards

d. Application of Testing Agency Labels and Seals

e. Notation of Dimensions Verified by Field Measurement

f. Notation of Coordination Requirements

g. Type and Model Numbers

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

B. Distribution: Furnish copies of final Submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

1. Do not proceed with installation until a copy of Product Data applicable is in the installer's possession.

2. Do not permit use of unmarked copies of Product Data in connection with construction.

1.07 SAMPLES

A. Where Samples are required, submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, full color-range sets, and swatches showing color, texture, and pattern.

1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Include the following:

a. Generic Description of the Sample

b. Sample Source

c. Product Name or Name of Manufacturer

d. Compliance with Recognized Standards

e. Availability and Delivery Time

2. Colors:

a. General: Unless the precise color and pattern is specifically described in the Contract Documents, whenever a choice of color or pattern is available in a

specified product, submit accurate color charts and pattern charts to the Architect for his review and selection.

3. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between the final Submittal and the actual component as delivered and installed.

    a. Where variation in color, pattern, texture, or other characteristics are inherent in the material or product represented, submit multiple units (not less than 3) that show approximate limits of the variations.

    b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

    c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample Submittals.

4. Preliminary Submittals: Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

    a. Preliminary Submittals will be reviewed and returned with the Architect's mark indicating selection and other action.

5. Maintain sets of Samples, as returned, at the Project site for quality comparisons throughout the course of construction.

    a. Unless noncompliance with Contract Document provisions is observed, the Submittal may serve as the final Submittal.

    b. Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to Subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the work.

1. Field Samples specified in individual Sections are special types of Samples. Field Samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.

    a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.08 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer to Architect, in quantities specified for 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 test results on material or Product, but must be acceptable to Architect.

1.09 MANUFACTURER INSTALLATION INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to Architect.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS

A. Source Limitations: To the greatest extent possible for each unit of work, provide products, materials, or equipment of a singular generic kind from a single source.

B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product or materials, select an option which is compatible with other products and materials already selected (which may have been from among options for those other products and materials). Total compatibility among options, if not assured by limitations within contract documents, must be provided by Contractor. Compatibility is a basic general requirement of product/material selections.

C. Owner's Approval Required:

1. In addition to the following, refer to the General Conditions, Article 4, for additional requirements.

2. The Contract is based on the materials, equipment, and methods described in the Contract Documents.

3. The Contract Drawings and Specifications establish the "minimum standard of quality" each product and/or system must meet to be considered acceptable. Products of other manufacturers will be considered if the product and/or system meets or exceeds the "minimum standard of quality" established by the Contract Documents.

4. The Owner will consider proposals for substitutions under the "or approved substitution" and the "or approved equal" provision of materials, equipment, and methods, only when such proposals are accompanied by full and complete technical data and all other information required by the Owner and Architect to evaluate the proposed substitutions.

   a. It will be the responsibility of the submitting Contractor to prove equality.

   b. Request must include “Contractor’s Substitution Request” Form, a copy of which is attached to this Section.

   c. The Submittal shall include a line-by-line, item-by-item description of the specified and proposed product.

5. Requests for substitutions must be submitted to the Architect NO later than 60 days after date of Owner-Contractor Agreement.

6. DO NOT SUBSTITUTE MATERIALS, EQUIPMENT, OR METHODS UNLESS SUCH SUBSTITUTIONS HAVE BEEN SPECIFICALLY APPROVED FOR THIS WORK IN WRITING.

D. "Or Approved Equal" or "Or Approved Substitution"

1. Where the phrase "or approved equal" or "approved substitution" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal by the Owner and Architect unless the item has been specifically approved for this work by the Owner.

   a. Color choices will be one of the determining factors for approval.

2. The decision of the Owner will be final.

E. Availability of Specified Items:

1. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the work.

2. In the event specified item or items will not be so available, so notify the Architect prior to the receipt of Bids.

3. Costs of delay caused on non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the Owner.

F. Whenever the Contractor secures approval for changing any items and such change involves a corresponding change or adjustment in any adjacent or related item, the responsibility for making the required change, or seeing that it is made, rests with the Contractor. The cost of these changes and/or adjustments shall be paid for by the Contractor unless it is otherwise agreed, in writing, at the time the change is approved. The acceptance of any change will not, in any way, relieve the Contractor from full compliance with the Contract Documents.

2.02 MANUALS

A. General: Where Manuals are required to be submitted covering items included in this work, prepare all such Manuals in durable plastic binders approximately 8-1/2 x 11 inches in size with at least the following:

1. Identification on or readable through the front cover stating the general nature of the Manual.

2. Neatly typewritten index near the front of the Manual furnishing immediate information as to location of all emergency data regarding the installation.

3. Complete instructions regarding operating and maintenance of all equipment involved.

4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.

5. Copy of all guarantees and warranties issued.

6. Copy of approved Shop Drawing(s) with all data concerning all changes made during construction

2.03 MISCELLANEOUS SUBMITTALS

A. Inspection and Test Reports Not Performed by Owner: Classify each inspection and test report as being either "Shop Drawings" or "Product Data" depending on whether the report is specially prepared for the project or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.

PART 3 EXECUTION

A. General: Prior to submittal for Architect's review, use all means necessary to fully coordinate all material, including the following:

1. Secure all necessary approvals from public agencies and others. Signify by stamp or other means that all required approvals have been obtained.

2. Clearly indicate all deviations from the Contract Documents.

B. The General Contractor shall submit a prioritized tabulation by date of Submittals required during the first 90 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.

1. These dates may be shown on Construction Project Schedule at Contractor's option.

3.02 TIMING OF SUBMITTALS

A. General

1. Make all Submittals enough in advance of scheduled dates for installation to provide all required time for reviews for securing necessary approvals, for possible revision and Resubmittals, and for placing orders and securing delivery.

2. In scheduling, allow a minimum of fourteen (14) full calendar days for the Architect's initial review following receipt of the Submittals. Allow additional time if the Architect requires coordination with subsequent Submittals.

    a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related Submittals are received.

    b. If an Intermediate Submittal is necessary, process the same as the initial Submittal. Allow fourteen (14) calendar days for reprocessing each Submittal.

LETTER OF CONFORMANCE

PROJECT: _____ PROJECT NO.: _____

CITY: _____ STATE: _____

CONTRACTOR: _____

The following product(s) has been selected for use in the above referenced project from the list of specified items.

Section Number: _____ Section Name: _____

Drawing Number(s): _____ Detail Number(s): _____

SPECIFIED ITEM TO BE USED:

_____

_____

_____

Statement of Conformance:

This Letter of Conformance is provided as a Submittal for Information in accordance with Section 01 33 00 - Submittals and Substitutions. The undersigned hereby declares that the Product identified above by manufacturer's name and model number is (one of) the product(s) specified and is suitable for the intended use as defined within the Contract Documents and will be provided and placed in operational condition in accordance with the manufacturer's published instructions and the Contract Documents.

SUBCONTRACTOR/SUPPLIER:

_____ Phone Number: ( ) _____

(Contact name of subcontractor/supplier offering above product)

_____

(Subcontractor / Supplier name and address)

CONTRACTOR:

_____ _____

(Contact name of Contractor) (Contractor signature and Title of Signatory)

CONTRACTOR'S SUBSTITUTION REQUEST

(Use separate form for each request)

Date: _____ Request No.: _____

TO: Architect _____
Phone: _____ Fax: _____

PROJECT: _____ Project No.: _____
CONTRACTOR _____

SPECIFIED
ITEM: _____
Section: _____ Page: _____ Paragraph: _____ Description: _____
Drawing
Number(s): _____ Detail
Number(s): _____
The undersigned request consideration of the following:
PROPOSED SUBSTITUTION:

_____

REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS:

_____

SAVINGS or CREDIT to OWNER for ACCEPTING
SUBSTITUTE: $ _____

Attached data includes description, Specifications, Drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. Proposed substitution has been fully checked and coordinated with the Contract Documents.
2. The proposed substitution does not affect dimensions shown on Drawings.
3. The proposed substitution does not require revisions to mechanical or electrical work.
4. The undersigned will pay for changes to the building design, including architectural and engineering design, detailing, and construction costs caused by the requested substitution.
5. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
6. Maintenance and service parts will be locally available for the proposed substitution.
7. The proposed substitution will have no adverse effect on LEED credits established through the CFRST LEED Volume Program. (Applies to CFRST LEED Volume Program Projects ONLY)

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Attachments: The attached data is furnished herewith for evaluation of the proposed substitution.
☐ Catalog ☐ Drawings ☐ Samples ☐ Reports ☐ Tests ☐ Other: _____
Submitted by:

_____ _____
(Firm) (Authorized Legal Signature)

_____ (_____) _____

(Address) (Telephone)

For use by the Architect: ☐ Accepted ☐ Accepted as Noted ☐ Rejected: Submit Specified Item

BY: _____

(Authorized Signature)

Date: _____ Remarks: _____

END OF SECTION

SECTION 01 35 13.21

SPECIAL PROCEDURES FOR HOSPITALITY PROJECTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. These Special Requirements contain changes and additions to the General Conditions and other Contract Documents. Where any Article or paragraph is modified or voided by these Special Requirements, the unaltered provisions shall remain in effect. In any case of conflict, these Special Requirements shall prevail.

B. Related Documents:

1. Drawings and Articles of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this Section.

2. All Contractors shall be governed by all applicable Sections of these Documents with reference to their respective areas of work. It shall be the responsibility of the General Contractor to apprise its Subcontractors and suppliers of these requirements.

a. The Contractor and each Subcontractor shall review all Sections of the Specifications and all Drawings and are responsible for all work pertaining to their trade regardless of Drawing or Section of Specifications it is written in.

1.02 GENERAL

A. The Contractor and each Subcontractor affirmatively represents that they are skilled and experienced in the performance of work as required by this project and in the use and interpretation of Drawings and Specifications such as those included in the Contract Documents; that they have carefully reviewed the Drawings and Specifications of this project; and that their Contract is based solely on these Documents, not relying in any way on any explanation or interpretations - oral or written - from any other source. The Contractor agrees that it shall be conclusively presumed that the Contractor has exercised his aforementioned skill and experience and found the Drawings and Specifications sufficient and free from ambiguities, errors, or omissions for the purpose of determining its Contract for the performance of the work in conformity with the Drawings, Specifications, and all other Contract Documents.

B. Each Contractor shall provide sufficient and adequate labor, materials and construction equipment necessary to properly correlate all phases of the work to the end that the approved Progress Schedule can be adhered to and the Substantial Completion Date met.

C. Each Contractor is responsible for all necessary development of the work to fulfill the intent of the Contract Documents for a complete and/or functioning system whether totally defined by the Drawings and Specifications or not.

D. In no case shall any Contractor proceed with work in uncertainty.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 COMMUNICATIONS

A. The Contractor shall forward all communications to the Owner through the Owner’s Representative.

B. Request for Information (RFI) and Supplemental Instructions

1. It shall be the Contractor's obligation to check the Contract Documents and to request of the Owner’s Representative any clarification necessary and in time so as not to delay the progress of the work.

3.02 RELATIONS WITH ADJOINING PROPERTY OWNERS

A. To facilitate his work, the Contractor may choose to make necessary arrangements for use and subsequent rehabilitation of the adjoining Owner's property. Such arrangements are solely the Contractor's responsibility.

B. If work is required off-site, outside the Contract limit lines, or on property of others, such areas shall be restored by said Contractor to their original condition, or as required by local authorities, immediately following completion of the work.

3.03 ACCESS TO SITE AND BUILDING

A. Access and security of the project site are the responsibility of the Contractor and not that of the Owner, the Architect, or the Owner's Representative.

1. All construction personnel shall protect work, existing facilities, and Owner's operations from unauthorized entry, vandalism, and theft.

3.04 EXAMINATION OF THE SITE

A. All Contractors submitting proposals for this work shall first examine the site and all conditions thereon. All proposals shall take into consideration all such conditions as may affect the work under this Contract.

3.05 GRADES, LINES, LEVELS, AND SURVEYS

A. Verify all grades, lines, levels, and dimensions as shown on the Drawings, and report any errors or inconsistencies discovered in the above to the Architect before commencing work. Provide and maintain established benchmarks in not less than two widely separated places.

3.06 FIELD MEASUREMENTS

A. The Contractor shall take measurements in the field to verify or supplement dimensions indicated on Drawings and shall be responsible for accurate fit of specified work. Any discrepancy between the Drawings and the actual conditions shall be reported immediately to the Architect.

B. Tolerances: The Contractor shall be responsible to maintain dimensions for spaces requiring close tolerances for such items as equipment or fixtures by "grounding" such locations. Uneven surfaces and joints will not be accepted which prevent the installation of units whose dimensions are shown in the documents.

3.07 USE OF SITE

A. Material Delivery and Storage

1. It shall be the responsibility of the Contractor to direct all deliveries to the construction site and not the Architect, the Owner's Representative, or the Owner.

B. The Contractor shall exercise control over all trucks and equipment using public roads and the Owner's property to preclude spillage, tracking of dirt or debris thereon. Should spillage occur, that Contractor is held to promptly clean and remove same.

3.08 PROTECTION

A. The Contractor shall provide and maintain guard lights for all work at all barricades, railings, obstructions in the streets, roads, or sidewalks, and at all trenches or pits as necessary to direct automobile and truck traffic as well as pedestrians. Remove such work when directed after necessity for same ceases.

1. The Contractor is responsible for all required OSHA temporary protection and barricades necessary for the completion of his work.

2. Any temporary fencing and sidewalk barricades required will be provided by the General Contractor.

B. The Contractor will be held responsible for all of his work and materials provided for by the Plans and Specifications until the work is completed and accepted.

1. The Contractor shall:

a. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

b. Prohibit traffic and storage on waterproofed and roofed surfaces and on lawn and landscaped areas.

c. Clean and repair damage caused by installation or use of temporary facilities.

C. Weather Protection

1. The Contractor shall at all times provide protection against weather -- rain, wind, storms, frost, or heat -- so as to maintain his work, materials, apparatus, and fixtures free from injury or damage. At the end of the day's work, all work likely to be damaged shall be covered.

2. During cold weather, the Contractor shall protect the work from damage. If low temperatures make it impossible to continue operations safely in spite of cold weather precautions, the Contractor shall cease work.

3. Any work damaged by failure to provide above protection shall be removed and replaced with new work at the Contractor's expense.

D. Dust Control and Partitions

1. The Contractor is responsible to completely control dust during the performance of his work, including any and all necessary measures such as dust enclosures, proper ventilation, etc. This also includes dust control during operations on the part of the Contractor in which services are provided by others. This cost is the responsibility of the Contractor.

2. The Contractor shall provide and remove upon completion all required weather and necessary dust-proof partitions, including doors, at locations required to phase the work, and as directed by the [Owner's Representative].

E. Water Control:

1. The Contractor shall provide, operate, and maintain pumps or other equipment necessary to drain his work. Keep excavation pits, trenches, and ditches, including the entire subgrade, free of any water under any circumstances that may arise.

3.09 FIRE REGULATIONS AND EXTINGUISHERS

A. The Contractor is responsible for fire extinguishers and fire protection for all work, equipment, office, sheds, etc., as required by OSHA regulations.

B. Free access shall be maintained at all times from the street to fire hydrants and to outside connections for standpipes. Fire doors shall be installed and in operation at the earliest possible time.

C. Where existing exits occur, they shall be fully maintained at all times and shall be kept free from materials, equipment, or other obstructions.

D. Combustible materials shall not be stored in the building.

E. The use of wood scaffolding shall be kept to a minimum and eliminated when possible in order to eliminate fire hazards from this source. No part of the building where forms are in place shall be used for the storage of flammable materials of any kind. Temporary structures of combustible material shall be located not less than 30 feet from the building.

F. No smoking or use of tobacco in any form shall be permitted within the building or on the roof surfaces.

3.10 HAZARDOUS MATERIALS

A. The Contractor shall comply with all laws concerning hazardous materials. Hazardous material shall be disposed in a legal manner. MSDS sheets for hazardous materials shall be filed at the Contractor's job site office and as otherwise required by law.

END OF SECTION

SECTION 014000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 QUALITY CONTROL

A. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
2. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

1.2 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. General contractor to provide allowance in the contract sum for cost of testing that is the responsibility of the owner.
2. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows: Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

END OF SECTION 014000

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

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

1.2 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 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 by progress of the Work.

3.2 TEMPORARY UTILITY INSTALLATION

A. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

C. Heating , ventilation, and cooling: Provide temporary heating and cooling required by

construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

D. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

E. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.3 SUPPORT FACILITIES INSTALLATION

A. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: 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. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.

D. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Termination and Removal: Remove each temporary facility when need for its service has ended, 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.

END OF SECTION 015000

SECTION 016000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 15 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, and similar final record information.
5. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
6. Complete final cleaning requirements, including touchup painting.
7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect 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.

1.2 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect 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.

1.3 WARRANTIES

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

B. Contractor to provide minimum one year contractor’s warranty.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, [elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
r. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. This Section specifies administrative and procedural requirements for Project Record Documents to be prepared and submitted by the General Contractor.
2. Project Record Documents required include:
   a. Marked-Up Copies of Record Drawings, Specifications, and Product Data
   b. Record Samples
   c. Miscellaneous Record Submittals

B. Related Sections:

1. General project closeout requirements are included in “Contract Closeout”, Section 01 77 00.
2. General requirements for submittal of Shop Drawings and Product Data are included in General Conditions and the Section “Submittals and Substitutions,” Section 01 33 00.
3. Specific record copy requirements that expand requirements of this Section are included in the individual Sections of Divisions 02 through 33.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Refer to General Conditions

1.03 RECORD DRAWINGS

A. The Contractor shall maintain a print set of Contract Drawings and Shop Drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where Shop Drawings are used for mark-up, record a cross reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information, which is recognized to be of importance to Owner, but was for some reason not shown on either Contract Drawings or Shop Drawings. Include all concealed work, which would be difficult to measure and record at a later date. Note related change order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on cover of each set.

B. Responsibility for Markup: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, Subcontractor, or similar entity, is required to prepare the mark-up on Record Drawings.

C. At time of Substantial Completion, submit Record Drawings to Owner for Owner's records in accordance with General Conditions

1.04 RECORD SPECIFICATIONS

A. The Contractor shall maintain one hard copy of specifications, including addenda, change orders, and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of option, and similar information on work where it is concealed or cannot otherwise be readily discerned at a alter date by direct observation. Note related record drawing information and product data, where applicable. Upon completion of mark-up, submit to Owner’s Representative.

1. The Contractor is responsible for collecting marked-up record Sections from each of the other Subcontractors, and for collating these Sections in proper numeric order with its own Sections to form a complete set of record Specifications. Submit to the Owner.

1.05 PRODUCT DATA

A. During the construction period, maintain one copy of each Product Data submittal for Project Record Document purposes.

1. Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site and changes in manufacturer's instructions and recommendations for installation.
2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
3. Note related Change Orders and mark-up of Record Drawings, where applicable.
4. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data. Refer to Section 01 78 23 for requirements. Submit to the Owner.
5. The Contractor is responsible for mark-up and submittal of record Product Data.

1.06 SAMPLES

A. Immediately prior to date of Substantial Completion, the Contractor shall meet with the Owner at the site to determine which of the Samples maintained during the construction period shall be transmitted to the Owner for record purposes. Comply with the Owner’s instructions for packaging, identification marking, and delivery to Owner's storage space. Dispose of other Samples in manner specified for disposal of surplus and waste materials.

1.07 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Owner.

1. Categories of requirements resulting in miscellaneous records include, but are not limited to, the following:
    a. Field Records on Excavations and Foundations
    b. Field Records on Underground Construction and Similar Work
    c. Survey Showing Locations and Elevations of Underground Lines
    d. Invert Elevations of Drainage Piping
    e. Surveys Establishing Building Lines and Levels
    f. Authorized Measurements Utilizing Unit Prices or Allowances
    g. Batch Mixing and Bulk Delivery Records
    h. Load and Performance Testing
    i. Inspections and Certifications by Governing Authorities
    j. Leakage and Water-Penetration Tests
    k. Fire Resistance and Flame Spread Test Results
    l. Final Inspection and Correction Procedures

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 RECORDING

A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

END OF SECTION

SECTION 03 1000

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings, Details of Construction, and General Provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Structural Testing and Special Inspection

B. Section 03 2000 - Concrete Reinforcing.

C. Section 03 3000 - Cast-in-Place Concrete.

D. Section 05 1200 - Structural Steel: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.4 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute; 2010.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; 2011.

D. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute; 2004.

1.5 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.6 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Submit product data for form release agents and dovetail anchor slots.

1.7 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 347, ACI 301, and ACI 318.

PART 2 PRODUCTS

2.1 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.

C. Chamfer outside corners of columns, and walls.

D. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.

2.2 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

2.3 FORMWORK ACCESSORIES

A. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

B. Form Ties: Removable type, galvanized metal, adjustable length, free of defects that could leave holes larger than 1 inch (25 mm) in concrete surface.

C. Dovetail Anchor Slot: Galvanized steel, 22 gage (0.8 mm) thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork. Match to tie manufacturer.

D. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.

PART 3 EXECUTION

3.1 EXAMINATION

A. Establish a bench mark in an accessible location and use as a reference point for various construction levels. Maintain in an undisturbed condition until final completion.

B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

A. Earth forms are not permitted.

3.3 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Lay out all work and check general building lines and levels established. Coordinate layout and measurements and if discrepancies arise, report them to the Architect.

D. Keep wood forms wet as necessary to prevent shrinkage.

E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

F. Align joints and make watertight. Keep form joints to a minimum.

G. Obtain approval before framing openings in structural members that are not indicated on drawings.

H. Coordinate this section with other sections of work that require attachment of components to formwork.

I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

J. Protect work at all times against the elements and other hazards. Cover and secure work.

3.4 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Build in recessed anchor slots for masonry veneer into concrete walls, columns, piers, beams, and spandrels deeper than 14 inches and wider than 16 inches. Position recessed anchor slots vertically, spaced at 16" on center.

E. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117.

B. Tolerances given in ACI 117 are not cumulative. Maximum tolerance for any formed surface, except footings, shall be one inch.

3.8 FIELD QUALITY CONTROL

A. Structural Special Inspection

1. Structural Special Inspection shall be performed by qualified parties as specified herein, and in accordance with the provision of Section 01 4533.

2. Formwork for slabs on grade and strip footings without transverse reinforcement does not require inspection. Additional exceptions may be noted on the structural drawings.

3. Personnel Qualifications: Special Inspector – Structural I: ICBO certified concrete inspector or a graduate civil/structural engineer, or other personnel acceptable to the Structural Engineer of Record (SER), with the experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a licensed structural engineer, as defined in Section 01 4533. The licensed engineer shall review and approve all inspection reports.

4. The Owner will provide the following inspections:
   a. Verify formwork for all concrete, except as noted above, will result in member size, location, and configuration as described on the contract documents, only as it affects the structural integrity of the concrete elements to be placed. Verify removal of shoring conforms to this section. Qualifications: Structural I.

3.9 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Forms for sides of walls, columns, and footings shall remain in place for a minimum of 24 hours.

C. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

D. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 1510

POST-INSTALLED ANCHORS

PART 1 GENERAL

1.1 CONTRACT CONDITIONS

A. Drawings, Details of Construction, and General Provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Requirements pertaining to post-installed anchors for materials and equipment. This section pertains to Divisions 3, 5, and 6 of these specifications that require post-installed anchors, unless specified otherwise.

1.3 RELATED REQUIREMENTS

A. Division 1 – General Requirements

B. Division 3 – Concrete

C. Division 5 – Metals

D. Division 6 - Wood, Plastics, and Composites

1.4 REFERENCES

A. ACI 355.2 – Standard for Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete; 2005

B. ASTM A 36 – Standard Specification for Carbon Structural Steel; 2005

C. ASTM A 193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

D. ASTM A 307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength; 2007b

E. ASTM B 633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2007

F. ASTM C 881– Standard Specification Epoxy-Resin-Based Bonding Systems for Concrete; 2002

G. ASTM F 593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2002

H. ASTM F 1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

I. ICC-ES AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2008

J. ICC-ES AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2008

1.5 QUALITY ASSURANCE

A. Post-Installed anchors and related materials shall be listed by one or more of the following agencies, as applicable:

1. ICC Evaluation Service

2. Underwriters Laboratories (UL) and/or Factory Mutual (FM)

3. IAPMO Evaluation Service

1.6 SUBMITTALS

A. Product Data: Submit data for proprietary materials, manufacturer's specifications (including finishes and/or materials), Material Safety Data Sheets (MSDS) and installation procedures.

B. Test Reports: ICC-ES or IAPMO-UES listings.

1.7 SUBSTITUTIONS

A. Only manufacturers with an ICC-ES or IAPMO listing will be considered for substitution requests.

B. The contractor shall submit for Engineer-of-Record's review, calculations that are prepared & sealed by a registered Professional Engineer demonstrating that the substituted product is capable of achieving the pertinent equivalent performance values of the specified product using the appropriate design procedure and/or standard(s) as required by the Building Code. In addition, the calculations shall specify the diameter and embedment depth of the substituted product.

C. Any increase in material costs for such submittal shall be the responsibility of the contractor.

PART 2 PRODUCTS

2.1 MATERIALS

A. Expansion Anchors

1. Concrete Wedge Anchors (expansion bolt):
   a. Carbon steel, ASTM B 633, Class SC1, Type I or III.

b. Stainless steel anchors (where noted): ASTM F 593, Type 303, 304 or 316.
c. Evaluation report issued by ICC-ES or IAPMO required.
d. Tested and qualified for performance in cracked and uncracked concrete in accordance with ACI 355.2 and ICC-ES AC193 for all mandatory tests.
e. Acceptable products include:
    1) Simpson Strong-Tie: Strong-Bolt (ICC-ES ESR-1771).
    2) Simpson Strong-Tie: Strong-Bolt 2 (ICC-ES ESR-3037)
    3) Hilti: Kwik Bolt TZ (ICC-ES ESR-1917).
    4) Powers Fasteners: Power-Stud+SD2 (ICC-ES ESR-2502).
    5) ITW Red Head: Trubolt+ (ICC-ES ESR-2427)

B. Adhesive Anchors

1. Adhesive anchors consist of an insert and an adhesive.

2. Inserts
    a. Threaded Rod Inserts: Provide preparation or configuration as recommended by manufacturer.
        1) Interior Exposure: ASTM A 307, ASTM A 36, ASTM A 193 Grade B7, or ASTM F 1554.

3. Adhesives for Concrete:
    a. Evaluation report issued by ICC-ES or IAPMO required.
    b. Tested and qualified for use in cracked and uncracked concrete in accordance with ICC-ES AC308 for all mandatory and optional seismic tests including creep tests.
    c. Epoxy: ASTM C 881 Type IV, Grade 3, Class B and C.
        1) Acceptable products include:
            (a) Simpson Strong-Tie: SET XP (ICC-ES ESR-2508).
            (b) Simspon Strong-Tie: ET-HP Epoxy (IAPMO ER-241).
            (c) Hilti: RE-500-SD (ICC-ES ESR-2322).
            (d) Powers Fasteners: PE1000+ (ICC-ES ESR-2583).
            (e) Powers Fasteners: PURE110+ (ICC-ES ESR-3298).
            (f) ITW Red Head: EPCON G5 (ICC-ES-ESR-1137).
            (g) ITW Red Head: EPCON C6+ (ICC-ES ESR-3577).
    d. Acrylic: Cartridge type, two-component, acrylic based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. Minimum physical requirements of ASTM C 881 Type IV, Grade 3, Class A, B and C.
        1) Acceptable products include:
            (a) Hilti: HY-200 (ICC-ES ESR-3187).
            (b) Powers Fasteners: AC100+ (ICC-ES ESR-2582).
            (c) Simpson Strong-Tie: AT-XP (IAPMO ER-263).
            (d) ITW Red Head: EPCON S7 (ICC-ES ESR-2308).

C. Concrete Screw Anchors

1. Concrete Screw Anchors:
    a. Carbon steel heat-treated or hardened.
    b. Zinc-plated in accordance with ASTM B 633, Class SC1, Type I or equivalent coating.
    c. Evaluation report issued by ICC-ES or IAPMO required.
    d. Tested and qualified for use per ICC-ES AC193 for all mandatory tests.

e. Acceptable products include:
    1) Simpson Strong-Tie: Titen HD (ICC-ES ESR-2713).
    2) Hilti: HUS-EZ (ICC-ES ESR 3027).
    3) Powers Fasteners: Wedge-Bolt+ (ICC-ES ESR-2526).
    4) ITW Red Head: Tapcon/Sammy (ICC-ES ESR-2202).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install anchors in strict accordance with manufacturer's printed instructions and, where required, requirements of ICC-ES evaluation reports.

B. Conform to manufacturer's requirements for, but not limited to, hole drilling methods, hole size, hole cleaning, substrate and adhesive temperatures, moisture presence in holes, and required edge distance and spacing.

C. Use special tools when recommended by manufacturer for installation of anchors unless otherwise permitted specifically by the Engineer or Architect of Record.

D. Drill holes in concrete, in accordance with the manufacturer’s recommendations.

3.2 FIELD QUALITY CONTROL

A. Manufacturer shall, on request, provide the services of a field representative to demonstrate to and train installers in proper installation techniques.

B. Structural Testing and Special Inspection

1. Structural Special Inspection shall be performed by qualified parties as specified herein, and in accordance with the provision of Section 01 4533.

2. Special Inspection, periodic or continuous, of post-installed anchors shall be provided as specified herein, but not less than as required by ICC-ES evaluation reports.

3. Definitions: ASNT - American Society for Non-Destructive Testing

4. Personnel Qualifications
    a. Special Inspector Technical I: ASNT Level I, employed by a testing agency and supervised by an ASNT Level III with a minimum of 10 years experience.
    b. Special Inspector Technical II: ASNT Level II, employed by a testing agency and supervised by an ASNT Level III with a minimum of 10 years experience.
    c. Special Inspector – Structural I: Graduate civil/structural engineer, or other personnel acceptable to the SER, with experience in design of structural systems of the project type. Inspections shall be performed under the direct supervision of a licensed structural engineer, as defined in Section 01 4533. The licensed engineer shall review and approve all inspection reports.

5. The Owner will provide the following tests and inspections:

a. Continuous special inspection during installation to verify materials delivered to site comply with contract documents, bolt type and dimensions, concrete type and compressive strength, pre-drilled hole dimensions and cleaning, embedment, spacing, edge distances, slab thickness, tightening torque, and any other items requiring inspection by product's ICC approval report. Qualifications: Technical II or Structural I.

END OF SECTION

SECTION 03 2000

CONCRETE REINFORCING

PART 1 GENERAL

1.1 CONTRACT CONDITIONS

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

1.2 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.3 RELATED REQUIREMENTS

A. Section 01 4533 - Structural Testing and Special Inspection

B. Section 03 1000 - Concrete Forming and Accessories.

C. Section 03 1510 - Post-Installed Anchors.

D. Section 03 3000 - Cast-in-Place Concrete.

1.4 REFERENCE STANDARDS

A. ACI 117 - Standard Specification for Tolerances for Concrete Construction and Materials; 2007

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.

C. ACI 315 - Details and Detailing of Concrete Reinforcement; 1999

D. ACI 318 - Building Code Requirements For Structural Concrete and Commentary; American Concrete Institute International; 2011.

E. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.

G. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2002

H. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy Coated Reinforcing Steel Bars; 2001 (Reapproved 2007).

I. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2009.

J. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute; 2011.

1.5 SUBMITTALS

A. See Division 1 for submittal procedures.

B. Shop Drawings: Follow recommended practices of ACI 315. Include size, length, bar schedules, shapes of bent bars, spacing of bars, methods of supporting reinforcing, and location and length of splices. Provide details as necessary to show final position of reinforcement in elements.

1.6 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver all reinforcement to the Project site bundled, tagged, and marked.

B. Store all reinforcing steel bars, ties, wire fabric, etc., on the site in a manner that will permit access for proper inspection and identification.

C. Do not exceed design capacity of existing construction or formwork.

D. Store reinforcing to avoid contact with mud, grease, or other materials that would affect bond.

E. Special handling for epoxy coated reinforcing to include:

1. Support epoxy-coated bars or bundles of bars to prevent damage to coating during transit.

2. Store epoxy-coated bars on protective cribbing.

3. Lift bundles of epoxy-coated bars at multiple pickup points to minimize bar-to-bar abrasion due to sags in the bundles.

4. Do not drop or drag epoxy-coated bars or bundles of bars.

5. Provide padded contact areas on equipment used for handling epoxy-coated bars.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).

1. Deformed billet-steel bars.

2. Unfinished.

3. Epoxy coated in accordance with ASTM A 775/A 775M where noted.

B. Reinforcement Accessories:

1. Chairs, Bolsters, Bar Supports, Spacers: CRSI MSP-1 Chapter 3. Sized and shaped for adequate support of reinforcement during concrete placement.
   a. Class 1 for all surfaces exposed to weather.
   b. Class 1 or 2 for interior surfaces exposed to view.
   c. Class 3 for surfaces not exposed to view.

2. Bar Supports and Accessories for epoxy coated bars: CRSI MSP-1 Chapter 3, Class 1A epoxy, vinyl, or plastic coated, all plastic supports, or precast supports with epoxy or plastic coated wire.
   a. Use epoxy-coated reinforcing bars as support bars.
   b. Fasten epoxy-coated reinforcing bars to bar supports, accessories, and each other with nylon, epoxy or plastic coated tie wire.

3. Patching Materials for Epoxy Coated Bars: ASTM D3963 Annex A1, inert in concrete.

4. Mechanical couplers: Develop 125% of yield strength, ICBO approved. Dayton/Richmond: Barlock Coupler System, Erico: Lenton Couplers, or approved equal.

5. Post-installed reinforcing adhesive: See section 03 1510

2.2 DETAILING

A. Detail reinforcing steel in accordance with ACI 315 and ACI 318.

B. Splice reinforcing where indicated on drawings. Specifically note proposed splices not shown on the drawings on the shop drawings and highlight for reviewer's acceptance.

C. Provide epoxy coated reinforcing for all concrete exposed to weather such as exterior walls, slabs, columns, piers, and stoop slabs. Additional locations may be noted on the drawings. Building foundation walls do not require epoxy coated reinforcing unless shown on the drawings.

D. Provide bar supports and other accessories sufficient to maintain reinforcing within specified placing tolerances. Consider requirements of CRSI MSP-1 to be a minimum.

E. Provide bar supports for all reinforcing, including footings, slabs on grade, and slab temperature reinforcing.

F. Consider normal construction activities while detailing number and type of bar supports.

G. Detail reinforcing to accommodate forming, fabricating, and placing tolerances and maintain a minimum cover as specified.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI 318 and ACI 301.

B. Fabricate within tolerances given in ACI 117.

C. Welding of reinforcement is not permitted.

D. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

PART 3 EXECUTION

3.1 PREPARATION - PLAIN BARS

A. Clean all reinforcement before placing. Remove oil, mill scale, pitting, mud, loose rust, strong alkali or organic matter.

B. Remove all excessive rust with wire brush or by sandblasting.

C. Reinforcement with rust and/or mill scale shall be acceptable if a hand-brushed test specimen meets the applicable ASTM requirements for dimension, weight, and height of deformations.

3.2 PREPARATION - EPOXY COATED BARS

A. Repair coating damage larger than 0.1 square inch in accordance with patching material manufacturer's recommendations.

B. Remove oil, mud, strong alkali, or organic matter prior to placement in forms.

3.3 PLACEMENT

A. Place reinforcing in accordance with approved shop drawings, support and secure reinforcement against displacement. Do not deviate from required position. Place within maximum tolerances given in ACI 117.

B. Splice reinforcing where indicated on drawings.

C. Install mechanical connectors in accordance with connection manufacturer's recommendations.

D. All bars must be placed before concrete is poured.

E. Provide templates for all column dowels.

F. Do not bend bars embedded in hardened or partially hardened concrete without approval from the Architect/Engineer. If bending is permitted, conform to procedures of ACI 301.

G. Support footing and slab on grade reinforcing. Do not lift or "step in" during placement of concrete. Use precast concrete, block, brick, or wire supports with earth bearing bases.

H. Do not displace or damage vapor barrier.

I. Reinforcing shall have the minimum concrete cover as given on the drawings.

3.4 INSTALLATION - EPOXY COATED REINFORCING

A. Do not field cut epoxy-coated reinforcing bars unless shown on Drawings or permitted by Engineer.

B. Do not use welded splices of epoxy-coated reinforcing bars unless shown on Drawings or permitted by Engineer. When used, welded splices shall conform to AWS D1.4. Welding of crossing bars (tack welding) for assembly of epoxy-coated reinforcement is prohibited.

C. Provide suitable ventilation when welding of epoxy-coated bars is required or permitted.

D. Do not use mechanical connections for epoxy-coated reinforcing unless shown on drawings or permitted by Engineer.

E. Repair coating damage due to heating, bending, cutting, welding or installation of mechanical connections, in accordance with ASTM D3963 and patching material manufacturer's recommendations.

F. Do not use epoxy-coated bars with damage, repaired and unrepaired, exceeding 2 percent of the surface area of each bar.

3.5 POST-INSTALLED REINFORCING

A. See section 03 1510 for installation requirements.

3.6 FIELD QUALITY CONTROL

A. Structural Special Inspection

1. Structural Special Inspection shall be performed by qualified parties as specified herein, and in accordance with the provision of Section 01 4533.

2. Concrete reinforcing in slabs on grade, footings without transverse reinforcement, and other locations as noted on the structural drawings does not require inspection. Special Inspector need not be present during entire reinforcing installation, but must observe all required reinforcing prior to concrete placement.

3. Personnel Qualifications:
   a. Special Inspector - Structural I: ICBO certified concrete inspector or a graduate civil/structural engineer, or other personnel acceptable to the structural Engineer of Record (SER), with experience in the design of structural systems of this type. Inspections shall be performed under the direct supervision of a licensed structural engineer, as defined in Section 01 4533. The licensed engineer shall review and approve all inspection reports.

4. The Owner will provide the following inspections:
   a. Inspect reinforcement in all cast in place concrete. Qualifications: Structural I. Verify the following:
      1) Reinforcing bar grade.
      2) Reinforcing bars are free of oil, dirt, excessive rust, and damage.
      3) Reinforcing bars are adequately tied, chaired, and supported to prevent displacement during concrete placement.
      4) Proper chair and tie wire materials are used.
      5) Proper clear distances between bars and to surfaces of concrete.
      6) Reinforcing bar size and placement.
      7) Bar laps for proper length and stagger.
      8) Bar bends for minimum diameter, slope and length.
      9) Mechanical splices are placed in accordance with the plans, specifications and reviewed shop drawings.
      10) Epoxy coating is presented at locations noted in the plans and specifications. include tie wires, chairs, bolsters, etc. Verify coating damaged is repaired in accordance with the contract requirements.

END OF SECTION

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.2 DEFINITIONS

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

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

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

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

E. Samples: For waterstops vapor retarder.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer.

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

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

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

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

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

1.6 PRECONSTRUCTION TESTING

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. 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. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

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

1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

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 Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that 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. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.

C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

E. Deformed-Steel Wire: ASTM A 1064/A 1064M.

F. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, deformed-steel wire, with less than 2 percent damaged coating in each 12-inch wire length.

G. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

H. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

I. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," 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 steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I/II, gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Water: ASTM C 94/C 94M.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

2.7 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb.
2. Dimensions: 6 inches by 3/8 inch thick; nontapered.

B. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb.
2. Dimensions: 6 inches by 3/8 inch thick; nontapered.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.9 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing No. 4 sieve.

B. Slip-Resistive Aluminum Granule Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of not less than 95 percent fused aluminum-oxide granules.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

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

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.12 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.

1. Cement Binder: ASTM C 150/C 150M, 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 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, 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 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

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

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

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

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Slag Cement: 50 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1inch nominal maximum aggregate size.

B. Foundation Walls: Normal-weight concrete.

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

C. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4500 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 520 lb/cu. yd..
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 6.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
7. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd..
8. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4.0 lb/cu. yd..

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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 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 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class C, 1/2 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct 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.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. 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.

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.

3.2 EMBEDDED ITEM INSTALLATION

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 rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 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 for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. 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 Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. 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.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

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.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement 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. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.7 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 Architect.

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 keyed joints as 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 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. 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 does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

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. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

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

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

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

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations 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 mixture constituents to segregate.

D. 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, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

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 defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. 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.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations 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 to produce a profile amplitude of 1/4 inch in one direction.
1. Apply scratch finish to surfaces indicated and to receive mortar setting beds for 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 to receive trowel finish.

D. Trowel Finish: After applying float finish, apply first troweling 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 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 and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

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

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and 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 Architect before application.

G. Slip-Resistive 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.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

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

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING 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 ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h 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 for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, 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. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture 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 certifies does not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power 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.
    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
    1. Defer joint filling until concrete has aged at least one month(s). 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 joints clean and dry.

C. Install semirigid 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.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 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 to solid concrete. Limit cut depth to 3/4 inch. 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 matches 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.

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 a 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 mixture 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 approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

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

B. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.
    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. Test results shall be reported in writing to Architect, 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 mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 034500

PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Architectural precast concrete cladding units.

1.2 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
   1. Loads: As indicated.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.
   1. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).

E. Welding certificates.

F. Material test reports: For aggregates.

G. Material Certificates: Signed by manufacturers:

H. Field quality-control test and special inspection reports.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
   1. Participates in PCI's plant certification program and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.

B. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

D. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

E. Calculated Fire-Test-Response Characteristics: Where indicated, provide architectural precast concrete units whose fire resistance has been calculated according to (ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies,") and is acceptable to authorities having jurisdiction.

F. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 2 sample panels approximately 16 sq. ft. (1.5 sq. m) in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

F. Prestressing Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.
   1. Coat unbonded post-tensioning strand with corrosion inhibitor passing ASTM D 1743 and sheath with polypropylene tendon sheathing. Include anchorage devices and coupler assemblies.

2.2 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I, gray, unless otherwise indicated.
   1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:
   1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
   2. Metakaolin Admixture: ASTM C 618, Class N.
   3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
   4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
   1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
      a. Gradation: To match design reference sample.
   2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

D. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.3 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable Iron Castings: ASTM A 47/A 47M.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).

L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M electrodeposition according to ASTM B 633, SC 3, Types 1 and 2.
   1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

2.4 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144, or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.
   1. Limit use of fly ash and silica fume to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): 5000 psi (34.5 MPa) minimum.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.6 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

E. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

F. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

G. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

H. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

I. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

J. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

K. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

L. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

M. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.7 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.8 FINISHES

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample and as follows:
1. Design Reference Sample: Match color, finish and texture of existing precast.

B. Finish exposed surfaces of architectural precast concrete units to match face-surface finish.

C. Finish unexposed surfaces of architectural precast concrete units by float finish.

2.9 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
   1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
   2. Unless otherwise indicated, provide for uniform joint widths to match existing condition.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

G. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.2 FIELD QUALITY CONTROL

A. Special Inspections: [Engage] a qualified special inspector to perform the following special inspections and prepare reports:
   1. Erection of precast concrete members.

B. Testing Agency: [Engage] a qualified testing agency to perform tests and inspections and prepare test reports.

C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 REPAIRS

A. Repair damaged architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.4 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
   1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
   2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

SECTION 035400

GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Description of Work: Work of this section includes underlayment for interior finish flooring and is not limited to the following

1. Maxxon Gyp-Crete Floor Underlayment

1.2 REFERENCES

A.	WBENC	WBENC Certified Business Enterprise www.maxxon.com
B.	Underwriters Laboratory	Fire Resistance Volume 1 www.ul.com
C.	GREENGUARD Certified	GREENGUARD Certified and GREENGUARD Gold Certified www.greenguard.org
D.	ASTM E336 and E1007	Field Sound Transmission Class (F-STC), Field Impact Insulation Class (F-IIC)
E.	ASTM E90 and E492	Sound Transmission Class (STC), Impact Insulation Class (IIC)
F.	ASTM C472M	Compressive strength of gypsum concrete
G.	ASTM F2170	Standard Test Method for Determining Relative Humidity in Concrete Floor Slab
H.	ASTM F2419	Standard Test Method for Installation of Thick Poured Gypsum Concrete and Preparation of Surface to Receive Resilient Flooring
	ASTM F2678	Standard Practice for Preparing Panel Underlayments, Thick Poured Lightweight Cellular Concrete Underlayments, and Concrete Subfloors with Underlayment Patching Compounds to Receive Resilient Flooring
I.	TCNA F 180	Tile Council of North America Installation Handbook www.tileusa.com
J.	NWFA	National Wood Flooring Association Instructions www.nwfa.org
K.	Finished Floor Goods Procedures	Maxxon Procedures for Attaching Finished Floor Goods to Maxxon Underlayments www.maxxon.com

1.3 SUBMITTALS

A. Product Data: Submit sale sheets Gyp-Crete Sales Sheet, Acousti-Mat Ultimate Sound Control Systems, Procedures for Attaching Finished Floor Goods to Maxxon Underlayments, and Maxxon's Building Conditions Guide with project materials clearly identified for each required product or system.

B. UL assembly confirmation

C. Acoustical Data: Submit sound tests according to IBC code criteria ASTM E492 (IIC) and ASTM E90 (STC) or ASTM E1007 (F-IIC) and E336 (F-IIC).

D. Code Approvals: See www.maxxon.com for the current list of code approvals.

1.4 SYSTEM REQUIREMENTS

A. Performance Requirements:

1. Gyp-Crete Floor Underlayment
   a. Compressive strength up to 2,200 psi (up to 15 MPa)
   b. Density 110 pounds per cubic foot (1,762 kg/m^3)
2. Sound Control – 2009 International Building Code: Section 1207.2 & .3
   a. Minimum Sound Transmission Class, 50 STC– Section 1207.2
      1) ASTM E90 and E336
   b. Minimum Impact Insulation Class, 50 IIC– Section 1207.3
      1) ASTM E492 and E1007

1.5 QUALITY ASSURANCE

A. Performance Standards:

1. All materials, unless otherwise indicated, shall be manufactured by Maxxon Corporation and shall be installed in accordance with its current printed directions and by a Maxxon Corporation Authorized Applicator.
2. Underlayment mix shall be tested for a slump using a 2" (i.d.) x 4" (50 mm x 101 mm) cylinder resulting in a patty size of 8 1/2" (216 mm) plus or minus 1 inch (25 mm) diameter.
3. Compressive strength tested in accordance with ASTM C 472M.

1.6 DELIVERY, STORAGE AND HANDLING

A. All materials shall be delivered in their original unopened packages and protected from damage and exposure from the elements. Damaged or deteriorated materials shall be removed from the premises.

1.7 PROJECT CONDITIONS

A. Before, during and after installation of product, building interior shall be enclosed, with adequate ventilation and heat maintained at a temperature above 50 °F (10 °C) to allow for drying of product.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Manufacturer: Maxxon Corporation, Hamel, MN. Telephone: (800) 356-7887.

2.2 MATERIALS

A. Proprietary products/systems: Poured flooring underlayment and topping products, including the following:

1. Gyp-Crete Floor Underlayment

B. Proprietary products/systems: Optional Sound Control that does not negate the fire rating and is specified in UL design. Acoustical performance is dependent on system design and construction.

1. Acousti-Mat® II HP Sound Mat

C. Maxxon Floor Primer:

1. Material Standard: Comply with specifications outlined in manufacturer's Design and Installation Guide for wood.

D. Mix Water:

1. Material Standard: Potable, free from impurities and from a domestic source.

E. Sand Aggregate:

1. Sand shall meet Maxxon Sand Specification 101.

F. Maxxon Overspray Primer Sealer:

1. Seal all areas that receive glue down floor goods with Maxxon Overspray according to manufacturer's specifications.

G. Maxxon Acrylic Primer Sealer (Alternate to Overspray):

1. Seal all areas that receive glue down floor goods with Maxxon Acrylic according to manufacturer’s specifications.

H. Maxxon Reinforcement or Maxxon CSM (Crack Suppression Mat):

1. If reinforcement in the Maxxon underlayment is needed or required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:

1. Installation shall not begin until the building is enclosed, including roof, windows, doors, and any other apertures.

2. Wood substrate shall be structurally sound, properly fastened, and dry. Contractor shall clean subfloor to remove mud, oil, grease, and other contaminating factors before arrival of the authorized applicator.
3. Wood substrate:
    a. The wood subfloor must be adequate to withstand live and dead loads with a deflection limitation of L/360.
    b. Wood should be agency approved 23/32” (1.8cm) T & G subfloor sheathing.

3.2 REQUIREMENTS

A. Leak Prevention:

1. Fill cracks and voids in subfloor where leakage of slurry could occur.

B. Priming subfloor:

1. Prime substrate according to manufacturer's recommendations.

C. Application:

1. Install in accordance with reference standards and manufacturer's instructions.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Mixing Proportions:

1. General Requirements: Mix proportions and methods shall be in strict accordance with product manufacturer recommendations.

B. Application:

1. Acousti-Mat Installations: Install Acousti-Mat following manufacturer's recommendations and specifications
2. Pour floor topping to recommended thickness. Immediately spread and screed product to a smooth surface. Expansion joints in all types of work shall be brought through the underlayment.
    a. Underlayment Depth: 1-1/2”

C. Drying:

1. The general contractor must provide and maintain correct environmental conditions to keep the building clean and dry, and protect against infestation of moisture from a variety of potential sources. The general contractor must supply mechanical ventilation and heat if necessary to remove moisture from the area until the Gyp-Crete is dry.
2. Protection from Heavy Loads: During construction, place temporary wood planking over Gyp-Crete wherever it will be subject to heavy wheeled or concentrated loads.

3.4 PREPARATION FOR INSTALLATION OF GLUE DOWN FLOOR GOODS

A. Sealing:

1. Seal all areas that receive glue down floor goods with Maxxon Overspray or Maxxon Acrylic according to the Maxxon Corporation's specifications. Any floor areas where the surface has been damaged shall be cleaned and sealed regardless of floor covering to be used. Where floor goods

manufacturers require special adhesive or installation systems, their requirements supersede these recommendations.

2. Maxxon UWR can be used over Maxxon underlayments in low traffic areas such as utility rooms, storage rooms and closets, as a protective surface.

B. Moisture Testing:

1. ASTM F2170 Test Method for Determining Relative Humidity in Concrete. Follow the respective floor goods manufacturers' recommendations for relative humidity requirements. When manufacturer does not have a relative humidity requirement, refer to Maxxon's *Procedures for Attaching Finished Floor Goods to Maxxon Underlayments* brochure.

C. Finished Floor Goods:

Flooring Type	Reference Standard
Resilient	ASTM F2419
Ceramic Tile	TCNA F180

END OF SECTION 035400

SECTION 042200

CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Embedded flashing.
6. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in concrete unit masonry.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Integral water repellant used in CMUs.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

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

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive

strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.

C. Concrete Building Brick: ASTM C 55.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight.

2.5 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 033000 "Cast-in-Place Concrete," and with reinforcing bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91/C 91M.

E. Mortar Cement: ASTM C 1329/C 1329M.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

I. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Spacing of Cross Rods: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire.

D. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A 240/A 240M or ASTM A 666, Type 304, 0.016 inch thick.
2. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. weight or 0.0216 inch thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. weight or 0.0162 inch thick.
3. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees.
5. Fabricate through-wall flashing with sealant stop unless otherwise indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
6. Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.

7. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees.
8. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
9. Solder metal items at corners.

B. Flexible Flashing: Use one of the following unless otherwise indicated:

1. Copper-Laminated Flashing: 7-oz./sq. ft. copper sheet bonded between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
2. Asphalt-Coated Copper Flashing: 7-oz./sq. ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.

3. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.
    a. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

4. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.

    a. Monolithic Sheet: Elastomeric thermoplastic flashing, 0.040 inch thick.
    b. Self-Adhesive Sheet: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of adhesive.
    c. Self-Adhesive Sheet with Drip Edge: Elastomeric thermoplastic flashing, 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive. Where flashing extends to face of masonry, rubberized-asphalt coating is held back approximately 1-1/2 inches from edge.
    d. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a sealant stop or flexible flashing with a metal sealant stop.
4. Where flashing is fully concealed, use metal flashing or flexible flashing.

D. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

E. Solder and Sealants for Sheet Metal Flashings:

1. Solder for Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. Solder for Copper: ASTM B 32, Grade Sn50 with maximum lead content of 0.2 percent.
3. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade,

class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

F. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. For reinforced masonry, use portland cement-lime, masonry cement, or mortar cement mortar.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.
4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will

comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

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

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4

inch in 10 feet, or 1/2-inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal

lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.9 LINTELS

A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant

complying with requirements in Section 079200 "Joint Sealants" for application indicated.

4. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
5. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.12 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades,

sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

H. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-

contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, and fabricator.

B. Welding certificates.

C. Mill test reports for structural steel, including chemical and physical properties.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout..

E. Survey of existing conditions.

F. Source quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use Allowable Stress Design; data are given at service-load level.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Combined system of braced frame and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles-Shapes: ASTM A 572/A 572M, Grade 50.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.

1. Weight Class: Standard.
2. Finish: Galvanized.

F. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

G. Steel Forgings: ASTM A 668/A 668M.

H. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.
2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc coating.

E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.

1. Configuration: Hooked.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

H. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Plain.

I. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

J. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

K. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.4 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug Tight.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.
6. Surfaces enclosed in interior construction.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug Tight.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

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

C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 051200

SECTION 054000

COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

    a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height.
    b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

    a. Upward and downward movement of 3/4 inch.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

B. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

2.2 COLD-FORMED STEEL FRAMING, GENERAL

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST50H.
2. Coating: G90 or equivalent.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1.
2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch.
2. Flange Width: 2 inches.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0677 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

    a. Minimum Base-Metal Thickness: 0.0677 inch.
    b. Flange Width: 1 inch plus the design gap for one-story structures.

2. Inner Track: Of web depth indicated, and as follows:

    a. Minimum Base-Metal Thickness: 0.0538 inch.
    b. Flange Width: dimension equal to sum of outer deflection track flange width plus 1 inch.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 55, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing, or infill studs and anchor to building structure.
4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Rough Hardware
2. Loose Bearing and Leveling Plates
3. Loose Steel Lintels
4. Metal Stairs
5. Ladders:
    a. Elevator Pit Ladder
6. Support Angles for Elevator Door Sills
7. Elevator Sump Pit Cover
8. Laundry Trench Grate
9. Miscellaneous Metal Trim
10. Steel Framing and Supports for Applications where framing and supports are not specified in other Sections

B. Related Sections:

1. Section 05 52 13 – Pipe and Tube Railings
2. Section 09 90 00 - Painting

1.02 REFERENCES

A. American Architectural Manufacturers Association (AAMA) Publications:

1. 2605 "Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels"

B. ASTM International Publications:

1. A27 "Standard Specification for Steel Castings, Carbon, for General Application"
2. A36 "Standard Specification for Carbon Structural Steel".
3. A47 "Standard Specification for Ferritic Malleable Iron Castings"
4. A48 "Standard Specification for Gray Iron Castings"
5. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
6. A123 "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"
7. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
8. A307 "Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength"
9. A563 "Standard Specification for Carbon and Alloy Steel Nuts"

10. A615 "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement"
11. A780 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings"
12. B429 "Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube"
13. B633 "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel"
14. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)"
15. E488 "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements"
16. F593 "Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs"
17. F594 "Standard Specification for Stainless Steel Nuts"
18. F1554 "Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength"

C. Federal Specifications (FS) Publications:
1. FS B 588 “Bolt, Toggle: And Expansion Sleeve, Screw” (Cancelled)
2. FS FF S 325
3. FS FF BS75
4. FS TT P664 - Paint 25 (supersedes FS TT-P-664), Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel”
5. DOD-P-21035A (formerly MIL-P-21035), Galvanizing Repair Specification

D. The American Society of Mechanical Engineers (ASME) Publications:
1. A17.1 “Handbook on Safety Code for Elevators and Escalators”
2. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"
3. B18.6.1 "Wood Screws (Inch Series)"
4. B18.6.3 "Machine Screws and Machine Screw Nuts"
5. B18.21.1 "Lock Washers (Inch Series)"
6. B18.22.1 "Plain Washers"

E. American Welding Society (AWS) Publications:
1. D1.1 "Structural Welding Code - Steel"
2. D1.2 "Structural Welding Code--Aluminum"
3. D1.3 "Structural Welding Code - Sheet Steel"

F. National Association of Architectural Metal Manufacturers (NAAMM) Publications:
1. "Metal Finishes Manual"
2. “Metal Stairs Manual”

G. The Society for Protective Coatings (SSPC) Publications:
1. SP - Surface Preparation Standards and Specifications
    a. SP 3 "Power Tool Cleaning"
    b. SP 6/NACE No. 3, “Commercial Blast Cleaning”
2. PA - Paint Application Standards, Guides, and Specifications

a. PA 1 “Shop, Field, and Maintenance Painting of Steel”

3. Paint - Paint and Coating Standards and Specifications

a. Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film)

b. Paint 20 “Zinc-Rich Coating, Type I - Inorganic and Type II - Organic”

c. Paint 25 (supersedes FS TT-P-664), Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel”

1.03 SYSTEM DESCRIPTION

A. System Performance Requirements:

1. All stairways, platforms, treads, and landings of Steel Stairs: Capable of supporting a live load of [100 lbf] per sf and a concentrated load of [300 lbf].

2. Ladders: Comply with ANSI A14.3.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Submit “Letter of Conformance” in accordance with Section 01 33 00 indicating specified items selected for use in project.

2. Product Data for each product specified.

a. Include supporting product data for products used in miscellaneous metal fabrications, including paint products and grout.

B. Submit Shop Drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

C. Submit samples representative of materials and finished products as may be requested by Owner’s Representative.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in successfully producing metal fabrications similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.

B. Installer Qualifications: Arrange for installation of metal fabrications specified in this Section by same firm that fabricated them.

C. Quality welding processes and welding operators in accordance with the following:

1. AWS D1.1 "Structural Welding Code - Steel"

2. AWS D1.3 "Structural Welding Code - Sheet Steel"

3. AWS D1.2 "Structural Welding Code - Aluminum"

D. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.06 PROJECT/SITE CONDITIONS

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.07 COORDINATION

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

PART 2 PRODUCTS

2.01 FERROUS METALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A36

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A500.

D. Steel Pipe: ASTM A53

1. Black finish, unless otherwise indicated.

2. Galvanized finish for exterior installations, unless shown to receive special coatings.

3. Type E, OR S, Grade B, Fy = 35 KSI, unless otherwise indicated, or another weight, type, and grade required by structural loads.

E. Gray Iron Castings: ASTM A48, Class 30

F. Malleable Iron Castings: ASTM A47, Grade 32510

G. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

H. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A153.

I. Welding Rods: Select in accordance with AWS Specifications for the metal alloy to be welded.

2.02 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B209/B209M, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B221/B221M, Alloy 6063-T6.

C. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

D. Aluminum Extruded Structural Pipe and Tubes: ASTM B429/B429M, alloy and temper recommended in writing by manufacturer for type of use and finish indicated.

2.03 FASTENERS

A. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required for each application and complying with applicable standards.

1. Bolts and Nuts: Regular hexagon head bolts, ASTM A307, Grade A with hex nuts ASTM A563; and, where indicated, flat washers.

2. Anchor Bolts: ASTM F1554, Grade 30

3. Lag Bolts: Square head type, ASME B18.2.1

4. Machine Screws: Cadmium plated steel, ASME B18.6.3

5. Wood Screws: Flat head carbon steel, ASME B18.6.1

6. Plain Washers: Round, carbon steel, ASME B18.22.1

7. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1

8. Drilled-in Expansion Anchors: Expansion Anchors Complying with FS FF S 325, Group VIII (anchors, expansion), Type I (internally threaded tubular expansion anchor); and machine bolts complying with FS FF BS75, Grade 5.

9. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

a. Interior Use - Material: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.

b. Exterior and Swimming Pool Use - Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.

10. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.04 GROUT AND ANCHORING CEMENT

A. Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior heavy-duty loading applications of type specified in this Section.

B. Avendra, LLC Preferred Manufacturers:

1. None

C. Approved Manufacturers:

1. "Euco N-S Grout", Euclid Chemical Co, An RPM Company (800-321-7628)

2. "Masterflow 713 Plus ", Degussa Building Systems, Inc (800-243-6739)

3. "Sonogrout 10K ", Degussa Building Systems, Inc (800-243-6739)

D. Interior Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

E. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

2.05 CONCRETE FILL AND REINFORCING MATERIALS

A. Concrete Materials and Properties: Comply with requirements of Section 03 30 00, and as shown on Drawings, with minimum 28-day compressive strength of 3,000 PSI, unless otherwise indicated.

B. Non-slip Aggregate Finish: Factory-graded, packaged material containing fused aluminum oxide grits or crushed emery as abrasive aggregate; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.

C. Reinforcing Bars: ASTM A615, Grade 60, unless noted otherwise.

2.06 PAINT

A. Shop Primer for Ferrous Metal: Manufacturer's or fabricator's standard, fast-curing, lead and chromate-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure complying with performance requirements of SSPC-Paint 25.

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. “Carbozinc 621"; Carboline Co. (800-848-4645)

b. “Tneme-Zinc 90-97”; Tnemec Co. (800-863-6321)

B. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC Paint 12 except containing no asbestos fibers.

D. All steel to be fireproofed shall not be primed.

2.07 FABRICATION - GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. 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 each metal fabrication.

B. 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. 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. Locate joints where least conspicuous.

C. Weld corners and seams continuously to comply with AWS recommendations and 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. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour

D. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

E. 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. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

F. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.08 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 woodwork, and for anchoring or securing woodwork to concrete or other structures. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.09 STEEL FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, railings newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

B. At Contractor's option, provide custom fabricated stairs or prefabricated stair assemblies with metal pan-type treads, attached to installed stringers using manufacturer's standard connection detail.

1. Avendra, LLC Preferred Manufacturers:
    a. None
2. Approved Manufacturers:
    a. Sharon Stairs by Duvinage, LLC (800-541-2645)
    b. American Stair Corporation, Inc. (800-872-7824)
    c. Approved substitution
3. Required Tread Styles:
    a. Concrete Fill Pan-Type Treads
4. Tread Finish:
    a. At locations shown not to be covered with finish materials provide a non-slip aggregate finish with factory-packaged abrasive aggregate made from fused aluminum-oxide grits or crushed emery, rust-proof and non-glazing.

C. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual"

D. Fabrication, General

1. Form steel stairs from materials of size, thickness, and shapes indicated, but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on Shop Drawings, using proven details of fabrication and support.

2. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

3. Shear and punch metals cleanly and accurately.

4. Remove sharp or rough areas on exposed surfaces.

5. 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.

6. Weld corners and seams continuously to comply with the following:

a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

b. Obtain fusion without undercut or overlap.

c. Remove welding flux immediately.

d. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

7. 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. Locate joints where least conspicuous.

8. Shop Assembly: Preassemble in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces. Clearly mark units for field assembly and coordinated installation.

E. Stair Framing: Fabricate stringers of structural steel channels. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers, newels, and framing members to stringers and headers. If using bolts, fabricate and join so that bolts are not exposed on finish surfaces.

1. Where masonry walls support steel stairs, provide temporary supporting struts designed for erection of steel stair components before installation of masonry.

2. Provide plate welded to top of stringer scribed to wall, to close off all gaps between stringers and walls.

F. Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required, to support total design loading.

1. Form metal pans of uncoated cold-rolled steel sheet, or hot rolled when approved in advance by Architect.

2. Directly weld risers and subtreads to stringers; locate welds on side of metal pans to be concealed by concrete fill.

G. Provide subplatforms of configuration and construction indicated; if not indicated, of same metal as risers and subtreads, in thicknesses required to support design loading. Attach subplatform to platform framing members with welds.

H. For stair railings and handrails requirements, refer to Section 05520 (05 52 00)

2.10 STEEL LADDERS

A. General: Fabricate ladders for the locations shown, with dimensions, spacings, and anchorages as indicated. Comply with requirements of ANSI A14.3.

1. For elevator pit ladders, comply with ASME A17.1.

B. Siderails: Continuous, steel, 1/2" x 2-1/2" flat bars, with eased edges, space 18" apart.

C. Bar Rungs: 3/4" diameter steel bars, spaced 12" o.c.

D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and at intermediate points space not more than 5' o.c. with welded or bolted steel brackets.

F. Provide nonslip surfaces on top of each rung, either by coating the rung with aluminum-oxide granules set in epoxy-resin adhesive, or by using a type of manufacture rung that is filled with aluminum-oxide grout.

2.11 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.12 LOOSE STEEL LINTELS

A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Hot-dipped galvanize loose steel lintels located in exterior walls.

C. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches bearing at each side of openings, if not indicated on Drawings.

2.13 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated or which are not a part of structural steel framework, as required to complete work.

B. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed. Spacing of anchors shall not be more than 24" o.c.

2.14 LAUNDRY TRENCH GRATE

A. Manufactures:

1. Avendra, LLC Preferred Manufacturers:

a. None:

2. Approved Manufacturers:

a. “Kordek PFR Isopthalic Polyester Resin”, Seasafe, Inc. (800-326-8842)

b. “Fibergrate Molded Gratings”, 1” x 1” x 4”; Fibergrate Composite Structures, Inc., An RPM Company (800-527-4043)

c. “Molded Square Fiberglass Gratings”; McNichols Co. (800-237-3828)

B. Provide square-mesh fiberglass grating, solid compression molded structure, 1” thick x size required, with bearing bars spaced at maximum 1” on center.

C. Frame: Construct perimeter frame using 1” x 3” x 3/16” seat angle welded to 3” x 3” x 3/16” support steel angle to form seat for trench grate. Weld corners and grind smooth. Grate to be removable.

D. Forming and Finishing:

1. Form laundry trench using fabricated perimeter frame and concrete forms as required to depth and shape indicated.

2. Set top of perimeter seat angle flush with finish floor, allowing for thickness of finish material.

2.15 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete. Align expansion joints in angles with indicated control and expansion joints in cavity-wall exterior wythe.

C. Galvanize shelf angles to be installed in exterior walls.

2.16 MISCELLANEOUS STEEL TRIM

A. Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination of assembly and installation with other work.

1. Galvanize miscellaneous framing and supports in exterior locations and where shown to be painted.

2.17 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for “Architectural and Metal Products” for recommendations relative to application and designations of finishes..

1. Finish metal fabrications after assembly.

2.18 STEEL AND IRON FINISHES

A. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process in compliance with the following requirements:

1. ASTM A153 for galvanizing iron and steel hardware.

2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick and heavier.

B. Paint Systems: Review painting specifications for finish paint systems. Coordinate surface preparations of steel and type of primer used with specifications and the manufacturer's recommendations to insure compatibility.

C. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications: Interiors (SSPC Zone 1A): SSPC SP 6/NACE No. 3, "Commercial Blast Cleaning".

D. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting, and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.02 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correctly welding work, and 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. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

3.03 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on shop drawings, if any.

B. Anchor supports securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated at girders supported on concrete or masonry, install as specified above for setting and grouting bearing and leveling plates.

3.04 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set leveling and bearing plates on wedges, shims, or leveling nuts. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonmetallic nonshrink grout, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.05 TOUCH-UP PAINTING

A. 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 to comply with SSPC PA 1 requirements for touch-up of field painted surfaces.

B. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION

SECTION 055213

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe handrails.

1.2 PERFORMANCE REQUIREMENTS

1. Handrails:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer’s product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

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

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Steel Pipe and Tube Railings:

    a. Pisor Industries, Inc.
    b. Sharpe Products.
    c. Wagner, R & B, Inc.; a division of the Wagner Companies.

2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

B. Steel and Iron:

1. Tubing: ASTM A 500 (cold formed).
2. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
3. Plates, Shapes, and Bars: ASTM A 36/A 36M.
4. Cast Iron: Either gray iron, ASTMA A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
5. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

D. Shop Primers: Provide primers that comply with Division 09 painting Sections.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. General: Fabricate railings to comply with design, dimensions, and details indicated, but not less than that required to support structural loads.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

D. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings.

E. Form changes in direction by bending or by inserting prefabricated elbow fittings.

F. Bend members in jigs to produce uniform curvature without buckling or otherwise deforming exposed surfaces.

G. Form changes in direction by bending or by inserting prefabricated elbow fittings.Close exposed ends of railing members with prefabricated end fittings.

H. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

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

2.5 FINISHES

A. Steel and Iron:

1. Shop-Primed Galvanized Railings: After galvanizing, clean railings, treat with metallic-phosphate process, and apply primer to comply with SSPC-PA 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

B. Attach railings to wall with wall brackets, except where end flanges are used. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt predrilled hole for exposed bolt anchorage.

C. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.2 Adjusting and Cleaning:

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055213

SECTION 060573.13

FIRE RETARDANT WOOD TREATMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fire retardant treatment for wood products specified in other Division 6 Sections, including:

1. Wood blocking and furring.

1.02 REFERENCES

A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

1. ASTM International:

a. ASTM D3201 Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Base Products.

b. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test.

c. ASTM D5516 Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.

d. ASTM D5664 Standard Test Method for Evaluating the Effects of Fire-Retardant Treatments and Elevated Temperatures on Strength Properties of Fire-Retardant Treated Lumber.

e. ASTM D6305 Standard Practice for Calculating Bending Strength Design Adjustment Factors for Fire Retardant Treated Plywood Roof Sheathing.

f. ASTM D905 Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compressive Loading.

g. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

h. ASTM E162 Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

i. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.

j. ASTM E1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter.

2. American Wood-Preservers' Association (AWPA):

a. AWPA C20-93 Structural Lumber - Fire-Retardant Treatment by Pressure Processes.

d. AWPA E6 Standard Method for Determining the Equilibrium Moisture Content of Fire-Retardant Treated Wood.

e. AWPA E12 Standard Method of Determining Corrosion Resistance of Metal in Contact with Treated Wood.

4. Boeing Support Standard (BSS):
    a. BSS 7239 Gas Analysis and Smoke Density Test.
5. National Fire Protection Association (NFPA):
    a. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials.
6. Underwriters Laboratories, Inc. (UL):
    a. UL 723 Standard for Safety for Surface Burning Characteristics of Building Materials.
7. National Evaluation Service, Inc.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide fire retardant treatment which will [Performance criteria] perform in accordance with manufacturer's stated performance criteria without defects, damage or failure and shall not contain phosphate based compounds.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's SPEC-DATA™ product sheet, for specified products.

C. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties. Include in test report certification that fire retardant solution does not contain phosphate.
2. Evaluation Report: National Evaluation Report NER-577 indicating flamespread, smoke development, strength durability, corrosion and hygroscopicity properties.
3. Certificates:
    a. Certification from treating plant certifying wood treatment applied complies with the criteria and physical requirements for fire retardant treated wood as herein specified.
    b. Certification that fire retardant chemicals do not contain phosphorus based compounds.
4. Closeout Submittals: Submit the following: a. Warranty: Warranty documents specified herein providing a minimum 50 year warranty on FRTW products.

1.05 QUALITY ASSURANCE

A. Source Quality: Obtain fire retardant treated wood from a single licensed manufacturer.

B. Wood Treatment Plant Qualifications: Wood treatment plant experienced in performing work of this section which has specialized in the treatment of wood similar to that required for this project, licensed by the manufacturer, with ongoing third party inspection program covering FRTW produced.

C. Regulatory Requirements: Provide fire retardant treatment which complies with the following regulatory requirements:

1. National Evaluation Report for FRTW - NER-577 indicating flamespread, smoke development, strength durability, corrosion and hygroscopic properties.
2. New York City Materials and Equipment Acceptance Numbers MEA 137-00-M (Lumber) and MEA 136-00-M (Douglas fir plywood).
3. City of Los Angeles Research Report Number RR 25442.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Exposure: Prevent exposure to precipitation during shipping, storage or installation. Replace fire retardant treated wood that has become wet during shipping, storage or installation.

1.07 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. Warranty Period: Fifty (50) years.

PART 2 PRODUCTS

2.01 FIRE RETARDANT TREATED WOOD

A. Manufacturer: Osmose, Inc. - Wood Preserving Group.

B. Proprietary Product(s)/System(s): FirePRO FRTW.

C. Fire Retardant Treatment: Manufacturer's proprietary solution for fire retardant treatment of wood as produced by manufacturer's licensed treatment plants, producing material meeting the following minimum standards:

1. Flamespread, Smoke Developed and Strength Durability:
    a. Treated wood shall have both flamespread, smoke developed, ratings of less than 25 when tested in an extended 30 minute tunnel test in accordance with ASTM E84, NFPA 255 or UL 723.
    b. Each piece of treated material shall bear a UL FR-S classification stamp.
2. Structural Lumber Treatment Standard: Comply with AWPA C20-93. Independent testing demonstrates, and published lumber design factors reflect, the superior strength durability properties of FirePRO FRTW.
3. Plywood Treatment Standard: Comply with AWPA C27-93. FirePRO fire retardant treated Douglas fir plywood exhibits no significant reduction in strength and utilizes essentially the same span table values published for untreated structural plywood panels by the APA.
4. Corrosivity: Provide fire retardant treated lumber and plywood evaluated in accordance with AWPA E12 for use with fastening materials specified. FirePRO FRTW shows very low hygroscopicity under relative humidity conditions as high as 90%. Test reports are available to design professionals upon request. 5. Hygroscopicity: Provide fire retardant

treated wood and plywood rated as Interior Type A High Temperature (HT) in accordance with Sections 2.2.2.1 of AWPA C20/C27 when tested at 92% relative humidity.

2.02 PRODUCT SUBSTITUTIONS

A. Substitutions: BY PRIOR APPROVAL ONLY

2.03 RELATED MATERIALS

A. Wood Materials: Refer to Division 6 Sections for related wood materials required to be treated as specified herein.

B. Fasteners: Provide metal fasteners for FirePRO FRTW of the following materials: aluminum 2024-T3; steel, SAE 1010; hot dipped galvanized steel; stainless steel; copper; or red brass.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product literature, technical bulletins, wraps, product catalog and installation instructions.

3.02 INSTALLATION

A. Select fire retardant treated wood members in accordance with manufacturer's published lumber design adjustment factors and plywood spans. Provide ventilation of building cavities as required by code.

B. Install fire retardant treated wood in accordance with requirements of applicable codes and related Division 6 Sections. Avoid milling operations that could adversely affect surface burning characteristics of fire retardant treated wood.

C. Install using manufacturer's recommended fasteners.

END OF SECTION

SECTION 06 12 13

STRUCTURAL PANEL CONCRETE SUBFLOOR

PART 1 - GENERAL

1.01 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Framing.
   2. Fasteners.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 05 40 00, Cold-Formed Metal Framing

1.03 SYSTEM DESCRIPTION

Structural Panel floor system consists of steel joists or framing members and Structural Panel Concrete Subfloor installed with mechanical fasteners.

1.04 REFERENCES

A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
C. ASTM A588/A588M – Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
D. ANSI/AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members
E. ANSI/AISI S210 – North American Specification for Cold-Formed Steel Framing – Floor and Roof System Design
F. ANSI/AISI S214 – North American Specification for Cold-Formed Steel Framing – Truss Design
G. ANSI/AISI S230 – Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings
H. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
I. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials
J. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C

1.05 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated:
   1. Floor framing shall be designed with a minimum deflection of L/360
   2. Follow the selected fastener layout for Screw Patterns, for the design Diaphragm Loads as described in the current Progressive Engineering, Inc.'s Evaluation Report PER-13067. Available at www.per13067.com.
   3. Panel Layout:
      a. Follow the USG Structural Panel Concrete Subfloor application described in the current Progressive Engineering, Inc.'s Evaluation Report PER-13067.

B. Fire Resistance Ratings: Provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

C. Noncombustible Ratings: provide materials and application procedures identical to those tested according to ASTM E136, "Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C."

D. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) in accordance with ASTM E90 and/or Impact Insulation Class (IIC) in accordance with ASTM E492 specified. Refer to USG Structural Panel Fire & Acoustic Manual - SCP100 for specific acoustical assemblies and performance ratings.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery:
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, brand, type and grade.

B. Storage:
   1. Store above ground in dry, ventilated space.
   2. Protect materials from soiling, exposure, and damage.
   3. If stored outside, material shall be covered with waterproof tarps.
      ***Note**: If Structural Panels are frozen while stored outdoors, allow to thaw-out naturally. Do not use salts or fertilizers to defrost the panels or attempt to pry them apart.*
   4. Panels must be stored over stable surface. Surface must be able to carry the load of the stored pallet(s). Each 20-piece pallet weights 3500 lbs (1542 kg). It is recommended that the load carrying capacity of the floor or surface be verified before storing panels.
   5. Pallets must not be stacked out of alignment by more than +/- 1/2" (13 mm) , measured on any side of the pallet.

1.09 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Do not install Structural Panel Concrete Subfloor when ambient or conditioned temperature is below 0 °F (-18 °C).
   2. Prior to the application of finished flooring, Structural Panel Concrete Subfloor must be conditioned at the same temperature as required for the finished flooring for at least 48 hours.
   3. Do not apply finished flooring or poured underlayment over Structural Panel Concrete Subfloor when wet, frozen or with surface frost.
      Note: If installed panels have snow or ice, do not use salts or defrosting agents, sand is recommended over slippery surfaces.

PART 2 – PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

A. Structural Concrete Panel: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.

2.02 MATERIALS

A. Structural Concrete Panel:
   1. USG Structural Panel Concrete Subfloor, A noncombustible structural subfloor panel manufactured in accordance with Acceptance Criteria AC318.

a. Panel Dimensions:
   i. Thickness: **3/4" (19 mm)**
   ii. Width: **4' (1220 mm)**
   iii. Lengths: **[8' (2440 mm)]** or **[6' (1829 mm)]** or **[6'-8" (2032 mm)]**
   iv. Long Edges: **Tongue and Groove**

b. Panel Properties:
   i. Moment Capacity: **1450 lb-in/ft (538 N-m/m)** tested in accordance with ASTM C1185, Sec.5
   ii. Bending Stiffness: **315,000 lb-in^2/ft (3 kN-m^2/m)** tested in accordance with ASTM C1185, Sec.5
   iii. Density: **75 lb/ft^3 (1200 kg/m^3)** tested in accordance with ASTM C1185
   iv. Weight: **5.0 lbs/ft^2 (24.4 kg/m^2)** tested in accordance with ASTM D1037 at a thickness of 3/4 inch (19 mm)
   v. Noncombustibility: **Pass** tested in accordance to ASTM E136
   vi. Surface Burning Characteristics: **0 – Flame Spread / 0 Smoke Developed** tested in accordance with ASTM E84
   vii. Mold Resistance: **10** tested in accordance with ASTM D3273
   0 tested in accordance with G21.

B. Structural Panel Concrete Subfloor Recommended Fasteners:
   a. In accordance with PER-13067 (Subfloor) and PER-14076 (Roof Deck), PER-15092 (Foundation Wall), and ESR-1792 (Subfloor).
   b. Use only fasteners recommended by USG. Go to www.USGSCP95.com for the current list of recommended fasteners.
   c. Install using the recommended spacing and distance from the Ends (square cut) and Edges (tongue & groove) of the panel.
   d. Any length of USG recommended fasteners may be used but do not use a larger size fastener unless specified by the structural engineer.

C. Floor Coverings and Underlayment:
   1. Follow floor covering manufacturers' installation procedures.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

B. Steel framing to receive the USG Structural Panel Concrete Subfloor shall be structurally sound, free from bows, twists or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of USG Structural Panel Concrete Subfloor.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Cold-Formed Steel Framing:
   1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
   2. The attachment flange or bearing edge for cold-formed steel must be a minimum 1-5/8" (41 mm) wide, 2" preferred, with at least 3/4" (19 mm) of the panel bearing on the supporting flange.

3. The size of the cold-formed steel framing flange required will vary based on the specified mil thickness/gauge and fastener selected.
4. Cold-formed steel framing thickness and size is always based on diaphragm capacity but must be a minimum 43 mil (18 gauge) and spaced no greater than 24" (610 mm) o.c. for up to 450 plf. When significant diaphragm capacity is required, 54 mil (16 gauge) may be required.
5. Joist bearing shall be provided at the foundation that is uniform and level.
6. Cold-formed steel joists shall be located directly over bearing studs or a header installed at the top of the bearing wall to distribute the load.
7. Joist framing must be perpendicular to rim joists.
8. On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joist ends are not otherwise restrained from rotation.
9. Additional joists shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
10. All blocking or bridging must be installed prior to the installation of USG Structural Panel Concrete Subfloor.
11. Framing must be of good quality, free of bows, twists or other malformations.

B. Hot-Rolled Steel Framing:
1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
2. Framing shape and size is always based on diaphragm capacity.
3. Hot-rolled steel framing shall have a 3” (76 mm) or larger bearing surface suitable for fastener insertion and panels must bear a minimum of 1 1/4” (32 mm) on the framing member.
4. Framing bearing shall be provided at the foundation that is uniform and level.
5. Joist framing must be perpendicular to support beams.
6. Additional framing members shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
7. All blocking or bridging must be installed prior to the installation of USG Structural Panel Concrete Subfloor.
8. Framing must be of good quality, free of bows, twists or other malformations.

C. USG Structural Panel Concrete Subfloor:
1. This product may contain respirable crystalline silica. Refer to OSHA Rule 29 CFR 1926.1153 for specific details about limiting worker exposure to respirable silica.
2. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust industrial HEPA vacuum collection device for control of dust and silica. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel. Collected dust shall be disposed in a safe manner and in compliance with local, state and federal ordinances.
3. USG Structural Panel Concrete Subfloor shall be installed with the long edges (tongue & groove) perpendicular to the framing.
4. The fire, sound and structural ratings listed in the USG Structural Panel Fire and Acoustic Manual - SCP100 for the USG Structural Panel Concrete Subfloor system are based on fastener attachment only, no adhesives. www.USGSCP100.com.

5. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed. Given that panel width is 48" (1220 mm), plan the layout so the first and last panel row width is a minimum of 24" (610 mm) wide. In the case where the row width is less than 24" (610 mm) wide, panels shall be blocked on all edges by framing (strapping is not sufficient).
6. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist. Place each panel across three or more supports [minimum two-span condition]. Less than full length panels at the end of a row may span a single framing opening. Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
7. USG Structural Panel Concrete Subfloor shall be fastened following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. Do not fasten all the corners first. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris. Do not gap the panels. Install the second panel and all subsequent panels in a similar manner to complete the row. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. Less than full length panels at the end of a row may be staggered by a single support.
8. Penetrations in the panels should be made before installing the panel whenever possible. If a penetration is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not scored. Support the ends and edges of any penetrations with framing if they are greater than 6" (153 mm) in any direction (refer to SCP14 Installation Guidelines).
9. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board. Go to www.USGSCP95.com for the current list of recommended fasteners.
10. Construction Traffic Protection – prior to floor finishing, place minimum 3/8” (9.525 mm) thick plywood sheathing materials on the floor in high traffic areas over newly installed USG Structural Panel Concrete Subfloor (i.e. additional USG Structural Panels or plywood). ¼” plywood may be used in lieu of 3/8” material provided it is fastened at all four corners to prevent shifting and curling. Thicker protecting material may be required if heavier loads are expected or work is to be performed that may damage USG Structural Subfloor.

END OF SECTION

SECTION 06 20 00

FINISH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wood Millwork
    a. Interior Standing and Running Trim
    b. Exterior Standing and Running Trim
2. Wood Panels and Veneers.
3. Shelving
4. Glass Fiber Reinforced Gypsum Curtain Valances
5. Metal Millwork Trim/Reveal

B. Related Sections:

1. Section 06 10 00 - Rough Carpentry
2. Section 09 21 16 - Gypsum Board Assemblies
3. Section 09 90 00 - Painting
4. Section 12 30 00 - Architectural Woodwork
5. Division 26 – Electrical

1.02 REFERENCES

A. American Wood Council / American Forest & Paper Association (AF&PA) Publications:

1. ANSI/AF&PA NDS-2005: "National Design Specification (NDS) for Wood Construction".

B. AWI Quality Standards

C. American Wood-Preservers's Association (AWPA) Publications:

1. C20 "Structural Lumber - Fire-Retardant Treatment by Pressure Processes"

D. ASTM International Publications:

1. E84-03: Test Method for Surface-Burning Characteristics of Building Materials
2. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
3. C1185 "Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards."
4. C1186 "Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets."

E. U.S. Department of Commerce, National Institute of Standards and Technology (NIST)

1. DOC PS 1 "Construction and Industrial Plywood"
2. DOC PS 20 "American Softwood Lumber Standard"

F. Hardwood Plywood & Veneer Association (HPVA)

1. ANSI/HPVA HP-1: "American National Standard for Hardwood and Decorative Plywood"

G. Code of Federal Regulations (CFR) Publications:

1. 40 CFR, Part 59, Subpart D 2001, "National Volatile Organic Compound Emission Standards for Architectural Coatings"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

C. Product Data and Shop Drawings: For each type of product specified.

1. Product Data indicating component profiles and fastening and joining details.

2. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

3. Samples for verification of the following:

a. Lumber products with factory-applied finish, 50 sq. in. for lumber for each finish system and color.

b. Linear Moldings: 2-foot-long section with finished joint. Show complete pattern.

c. Nonlinear Shapes: Full-size unit.

4. Shop Drawings: Show profiles, thicknesses, finishes, joints, ornamentation, installation tolerances, and anchorage details. Indicate attachment methods, embedded supports, reinforcement, fabrication methods, joint treatments, clearances, and supports.

a. Show connection to suspension system and cutouts for sprinklers, diffusers, grilles, speakers, and lighting fixtures.

1.04 QUALITY ASSURANCE

A. Factory-mark each piece of lumber and plywood with type, grade, mill, and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

B. Perform finish carpentry work in accordance with AWI Quality Standards, Custom Grade.

C. Fire-Test-Response Characteristics: Provide glass-reinforced gypsum fabrications with the following surface-burning characteristics as determined by testing identical products per ASTM E84 by UL or another independent testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame Spread: 25 or less.

2. Smoke Developed: 450 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect finish carpentry materials during transit, delivery, storage, and handling to prevent damage, soiling, and deterioration.

B. Do not deliver finish carpentry materials, until painting, wet work, grinding, and similar operations which could damage, soil, or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

C. Ship and store glass-reinforced gypsum fabrications in factory-wrapped crates, packaged to keep units dry. Avoid cracking, warping, or staining the units.

1.06 PROJECT CONDITIONS

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas.

B. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels throughout the remainder of construction period.

1. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity.

2. Acclimatize glass-reinforced gypsum fabrications to ambient temperature and humidity of spaces in which they will be installed. Remove packaging and move units into installation spaces not less than 48 hours before installing them.

C. Weather Limitations: Proceed with installing exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

D. Field Measurements: Where glass-reinforced gypsum fabrications are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.07 COORDINATION

A. Coordinate layout and installation of glass-reinforced gypsum fabrications and suspension system components with other construction, including ceilings, light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:

1. Northeastern Lumber Manufacturers Association (NeLMA)

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."

E. Hardwood Plywood: Comply with ANSI/HPVA HP-1, "Interim Voluntary Standard for Hardwood and Decorative Plywood."

2.02 INTERIOR STANDING AND RUNNING TRIM

A. Hardwood Lumber: PS 58; Premium Grade in accordance with AWI; maximum moisture content of 15 percent.

1. Stained Interior Wood Trim and Millwork: Yellow Birch - "Select White" (Sapwood), Grade 1, solid lumber stock, sizes and shapes shown on Drawings, of straight grain type sufficient to receive stained finish, smooth surfaced.

2. Painted Interior Wood Trim and Millwork: Poplar, Paint Grade, solid lumber stock, sizes and shapes shown on Drawings, of grain type sufficient to receive stained finish, smooth surfaced.

B. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.

2.03 WOOD EXTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim: Provide finished lumber and moldings complying with the following requirements including those of the grading agency listed with species:

1. Species: Western Red Cedar; WCLIB, grade as follows:

a. Cedar Grade: Select and Quality Knotty

2. Texture: Smooth surfaced

3. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.

B. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and patterns as shown, unless otherwise indicated.

2.04 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide nails, screws, and other anchoring devices of the type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications. Provide in sufficient length to penetrate minimum of 1-1/2 inches into substrate, unless otherwise recommended by manufacturer.

1. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating complying with ASTM A153, or stainless steel.

2.05 FABRICATION – WOOD FINISH CARPENTRY

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate finish carpentry to dimensions, profiles, and details indicated.

1. Back out or kerf backs of the following members, except members with ends exposed in finished work:

a. Interior standing and running trim, except shoe mold and crown mold.

2. Ease edges of lumber less than 1-inch (25 mm) in nominal thickness to 1-1/6 inch (1.5 mm) radius.

2.06 SHEET MATERIALS

A. Shelving: 3/4" thick by width shown on Drawings, Hardwood Plywood; custom grade in accordance with AWI; core material of veneer; type of bond recommended for application; with minimum 3/4" x 1-1/4" hardwood nosing.

B. Softwood Plywood: DOC PS 1, Medium Density Overlay.

2.07 FIRE RETARDANT TREATED (FRT) LUMBER

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Lumber:

a. Dricon FRT"; Lonza Wood Protection (678-627-2000)

b. "Pyro-Guard"; Hoover Treated Wood Products, Inc. (877-722-6292, ext. 211)

c. "FirePRO FR Lumber"; Osmose Wood Preserving, Inc. (404-228-8434)

2. Plywood:

a. “FRX Exterior FRT"; Lonza Wood Protection (678-627-2000)

b. "Exterior Fire-X"; Hoover Treated Wood Products, Inc. (877-722-6292, ext. 211)

C. Comply with performance requirements in AWPA C20, Exterior type. Kiln dry after treatment to a maximum moisture content of 19 percent.

D. Flamespread and smoke developed ratings of 25 or less by ASTM E84, with no sign of progressive combustion when test is extended to 30 minutes.

E. Toxicity/IEQ: Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.

2.08 Wood Veneers and Panels

A. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. Veneers: (Refer to Interior Finish Index for species, locations and other specifications for the following materials):

1) Scott Brogan Group (973-448-2934)

2) Materials, Inc (301-788-8957)

b. Panel Systems: (Refer to Interior Finish Index for species, locations and other specifications for the following materials)

1) Soelberg Industries (888-228-8207)

B. General:

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

2. Wood Moisture Content for Interior Materials:

a. Maximum moisture content of 15 percent

C. Hardwood Veneer Plywood Paneling:

1. Manufacturer's stock hardwood plywood panels complying with HPVA HP-1

2. Face Veneer Species: Refer to the Interior Finish Index.

3. Veneer Matching: As approved by Marriott.

4. Panel Sizes: As shown on Drawings.

2.09 GLASS FIBER REINFORCED CURTAIN VALANCES

A. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. Formglas Inc. (416-635-8030)

b. Approved Substitution by Marriott International

B. Steel Framing Components

1. Framing Components: As indicated and that comply with steel framing components specified in Section 09 21 16 (09255) “Gypsum Board Assemblies”.
2. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.162-inch diameter.
3. Hanger Rods: Mild steel and zinc coated or protected with rust-inhibitive paint.
4. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.
5. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:
    a. Carrying Channels: 1-1/2 inches deep, 475 lb/1000 feet, unless otherwise indicated.
    b. Furring Channels: 3/4-inch-deep, 300 lb/1000 feet, unless otherwise indicated.
    c. Finish: [Rust-inhibitive paint
6. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E1190 conducted by a qualified independent testing agency.
7. Steel Studs and Runners: ASTM C645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
    a. Thickness: As indicated.
    b. Depth: As indicated.
    c. Protective Coating: ASTM A653, G40 hot-dip galvanized coating.
8. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing members securely to substrates.

C. Glass-Reinforced Gypsum Fabrication Materials
1. Glass-Reinforced Gypsum Fabrications: ASTM C1355.
    a. Properties:
        1) Shell Thickness: 1/8” to 3/16”, as shown on Drawings.
        2) Perimeter Edge Thickness: ¾” or 1”, as shown on Drawings.
        3) Weight (depending on reinforcing): 2 – 3 lbs/sf.
        4) Density: 110 lbs/sf.
        5) Ultimate Tensile Strength: 1200 – 1400 psi.
        6) Modulus of Elasticity in Tension: 2.7 – 3.8 x 106 psi.
        7) Modulus of Elasticity in Flexure: 2.1 – 2.2 x 105 psi.
        8) Flame Spread, Smoke Index & Fuel Contribution (ASTM E84): 0
2. Embedments: As standard with glass-reinforced gypsum fabrication manufacturer and as required for reinforcement and for anchorage to substrates and framing.

D. Auxiliary Materials
1. Adhesives: As recommended in manufacturer's written instructions.
    a. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), or as listed in VOC limit tables in Section 01 81 19 “Indoor Air Quality Requirements”. Products furnished shall comply with whichever VOC content requirement is more stringent.

2. Steel Drill Screws: Provide fasteners, complying with the following requirements that are of sufficient length and size to securely fasten gypsum-reinforced fabrications to framing members:

3. Joint Treatment Materials: Provide materials complying with ASTM C475 and with the recommendations of the manufacturers of both glass-reinforced gypsum fabrications and joint treatment materials for each application indicated.

4. Control Joints: One-piece control joint with V-shaped slot and removable strip covering slot opening, formed from steel sheet zinc-coated by hot-dip process or from rolled zinc, and complying with ASTM C1047.

E. Fabrication

1. Fabricate glass-reinforced gypsum units from molds constructed of rigid materials that will result in smooth-finished surfaces conforming to profiles, dimensions, and tolerances indicated. Provide units as large as practical to minimize joints.

2. Remove units from molds and repair hollows, voids, scratches, and other surface imperfections.

3. Material Compatibility: Fabricate glass-reinforced gypsum fabrications with surface characteristics required for a high-gloss paint finish.

4. Embedments: Incorporate embedments so they develop the full strength of glass-reinforced gypsum fabrications. Cover embedments with glass-reinforced gypsum composite not less than 3/16 inch thick.

5. Connection Hardware: Custom designed and fabricated to support and connect glass-reinforced gypsum fabrications to hangers, support framing, and substrates.

6. Dimensional Tolerances of Units: As follows:

a. Factory-Finished Edge Straightness: Plus or minus 1/8 inch.

b. Plane Surface Straightness: Plus or minus 1/8 inch.

c. Overall Assembled Length and Width: Plus or minus 1/8 inch per 10 feet.

d. Chords, Radii, and Diameters: Plus or minus 1/8 inch.

e. Squareness: Not more than 1/4-inch difference between diagonals in 16 sq. ft.

2.10 TRIM ACCESSORIES

A. Millwork Trim: Metal edge trims to provide reveal in wood paneling.

1. Approved Manufacturer

a. "F Reveal Molding DRM-50-100"; Fry Reglet Corporation (800-237-9773)

2. Material:

a. Reveal Depth: 1/2"

b. Reveal Width: 1"

3. Color: Factory Primed. Refer to Interior Finish Index

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerance and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

C. Prime and backprime lumber for painted finish exposed on the exterior not indicated as factory prefinished. Comply with requirements for surface preparation and application in Division 09 Section "Painting."

D. Ensure that all electrical or other services are in place.

3.03 INSTALLATION – FINISH CARPENTRY

A. Discard units of material which are unsound, warped, bowed, twisted improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install the work 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 countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.

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

D. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.

E. Install to tolerance of 1/8 inch in 96 inches for plumb and level. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16 inch maximum offset for reveal installation.

F. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.

G. Finish according to specified requirements.

H. Anchor finish carpentry work to anchorage devices 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. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.04 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.

1. Match color and grain pattern across joints.

2. Install trim after gypsum board joint finishing operations are completed.

3. Drill pilot holes in hardwood before fastening to prevent spitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

3.05 INSTALLATION - GLASS FIBER REINFORCED CURTAIN VALANCES

A. Steel Framing Installation

1. Steel Framing Installation Standard: Install steel framing to comply with ASTM C754 and with details indicated. Select framing components of type, size, and spacing needed to support weight of glass-reinforced gypsum fabrications and to maintain erection tolerances.

2. Supplementary Framing, Blocking, and Bracing: Install supplementary framing as required not only to support glass-reinforced gypsum fabrications but also fixtures and other items penetrating glass-reinforced gypsum fabrications.

B. Glass-Reinforced Gypsum Fabrication Installation

1. Install glass-reinforced gypsum fabrications level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

a. Lift units with suitable devices as recommended by manufacturer.

2. Predrill fastener holes in glass-reinforced gypsum fabrications. Clean fastener holes to remove dirt and oil.

3. Attach glass-reinforced gypsum fabrications to framing and substrates with steel drill screws. Do not use pneumatic staple guns. Countersink screw heads below adjoining finished surface.

4. Fasten as required to comply with dimensional tolerances and not less than 5/16 inch from edge to end.

5. Cover screw heads with joint compound to produce flush, smooth, and level finished surfaces.

6. Attach glass-reinforced gypsum fabrications at joints with adhesive, and band or brace together until adhesive is cured. Cure adhesive according to glass-reinforced gypsum fabrication manufacturer's written instructions.

7. Install control joints where indicated.

8. Joint Finishing: Comply with ASTM C840 for the following finish level:

a. Level 5.

C. Erection and Location Tolerances

1. Erection Tolerances: Install glass-reinforced gypsum fabrications so each unit complies with the following dimensional requirements:

a. Plane Alignment (Panel to Panel): 1/16 inch.

b. Variation from Plumb: Plus or minus 1/8 inch per 10 feet.

c. Variation from Straightness: Plus or minus 1/4 inch per 25 feet.

d. Assembly Deflection: Not greater than the length of the assembly divided by 240.

e. Joint Alignment: Not more than 1/8 inch.

f. Joint Width: Not more than 3/8 inch.

3.06 ADJUSTMENT, CLEANING, FINISHING, AND PROTECTION

A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up factory-applied finishes to restore damaged or soiled areas.

C. Preparation for Finishing: Sand work smooth and set all nails and screws. Apply wood filler in exposed nail and screw indentations.

D. Cleaning: Keep premises in a neat, safe, and orderly condition at all times during execution of this portion of the work, free from the accumulation of sawdust, cut ends, and debris.

E. Refer to Division 09 sections for final finishing of installed finish carpentry work.

F. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

SECTION 06 25 00

PREFINISHED PANELING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Factory-Finished Wood Paneling.

B. Related Sections:

1. Section 06 20 00 – Finish Carpentry

1.02 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product Data: Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

C. Product Data: For each type of product specified including:

1. Submit manufacturer's product and maintenance data for each type of wood flooring (paneling).

a. Certification by wood flooring (paneling) and adhesive manufacturers that products supplied for paneling installation comply with local regulations controlling use of volatile organic compounds (VOCS).

2. Submit samples in in the form of actual sections of wood flooring (paneling) showing full range of colors and texture variations expected.

3. Shop Drawings: Show installation details including location and layout of each type of wood paneling and accessory.

4. For composite wood products, documentation indicating that the bonding agent contains no urea formaldehyde.

1.03 QUALITY ASSURANCE

A. Single-Source Responsibility for paneling: Obtain each type, and color of paneling from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the work.

B. Installer Qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this Project, including specific requirements indicated.

1. Acceptable to or licensed by manufacturer.

C. Mockups: Install mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect wood paneling materials from exposure to moisture. Do not deliver wood paneling materials until building is enclosed, after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry and HVAC System is operating and will maintain temperature and relative humidity at required levels for the remainder of the construction period.

B. Store wood paneling materials in dry spaces protected from the weather with ambient temperatures maintained between 60 degrees F. and 80 degrees F. Store paneling materials on flat surfaces. Move paneling and installation accessories into spaces where they will be installed at least seven (7) days in advance of installation.

1.05 PROJECT CONDITIONS

A. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood paneling during the conditioning period.

1. Conditioning period shall begin not less than seven days before wood paneling installation, is continuous through installation, and continues not less than seven days after wood paneling installation.

B. Wood Paneling Conditioning: Move wood paneling into spaces where it will be installed, no later than the beginning of the conditioning period.

1. Do not install wood paneling until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.

2. Open sealed packages to allow wood paneling to acclimatize immediately on moving paneling into spaces in which it will be installed.

C. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

D. Install factory-finished wood paneling after other finishing operations, including painting, have been completed.

1.06 SEQUENCING AND SCHEDULING

A. Do not install wood paneling materials until related units of Work specified in other Sections has been completed.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Avendra, LLC Preferred Manufactures:

1. None

B. Approved Manufacturers:

1. “Solid Wood Tambour”; Surfacing Solution (800-964-6727)

2.02 WOOD PANELING:

A. Engineered-Wood Panels: Refer to Interior Finish Index

1. Species: Walnut

2. Grade: Suitable for all levels

3. Width: Refer to Drawings

4. Length: Refer to Drawings

5. Profile: T375

2.03 INSTALLATION ACCESSORIES

A. Adhesives: As recommended by manufacturer.

1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Trim: In same specie and grade as wood paneling, finished to match, unless otherwise specifically indicated.

C. Other materials, including items not specifically described, but required for a complete and proper installation of wood paneling, shall be only as recommended by the manufacturer of material to which it is applied.

PART 3 EXECUTION

3.01 INSPECTION:

A. Installer must examine the areas and conditions under which paneling and accessories are to be installed and 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.

1. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

2. For adhesively applied wood paneling, verify that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

3. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the substrate. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.02 PREPARATION

A. General: Comply with manufacturer's installation specifications for preparing substrates to receive products indicated.

B. Clean substrates to be covered by wood paneling materials immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Remove coatings, adhesives, plastics, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone. Surface to receive new paneling shall be prepared, including removal of existing materials not acceptable for proper installation of new materials, as required by manufacturer. Do not use solvents.

D. Use leveling compound as recommended by manufacturer for filling small cracks and depressions in walls.

3.03 INSTALLATION

A. Install paneling after finishing operations, including painting, have been completed. Building air temperature, and relative humidity must be within limits recommended by paneling manufacturer's directions.

B. Patch and repair walls to receive paneling for proper installation of paneling and accessories.

C. Place paneling with adhesive cement in strict compliance with manufacturer's recommendations. Provide expansion space at perimeters and terminations as recommended by manufacturer.

D. Install paneling level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

E. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on paneling. Use chalk or other non-permanent marking device.

F. Tightly cement paneling to substrate without open cracks, voids, raising and puckering at joints, telegraphing of substrate conditions, or other surface imperfections.

G. Except as specifically indicated install paneling with grain in tile running in same direction.

H. Scribe, cut, and fit paneling to butt neatly to adjacent surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings. Leave space for expansion.

I. If Nails are used, fill nail holes with matching filler where exposed.

3.04 CLEANING AND PROTECTION:

A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.

B. Protect paneling against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by manufacturer of product involved.

C. Clean products specified in this Section not more than four days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer. Perform initial maintenance including cleaning and polishing in accordance with manufacturer's instructions.

END OF SECTION

SECTION 06 61 13

CULTURED MARBLE FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast Polymer

a. Tub and Shower Surrounds

b. Shower Bases (Pans)

B. Related Sections:

1. Section 01 81 13 - Sustainable Design Requirements
2. Section 06 10 00 - Rough Carpentry
3. Section 06 20 00 - Finish Carpentry
4. Section 10 28 19.21 – Tub and Shower Doors
5. Section 12 30 00 - Architectural Woodwork
6. Section 12 36 40 - Cut Natural Stone Tile: Granite Countertops
7. Section 12 36 61 - Engineered Stone Countertops
8. Section 12 36 61.13 – Cultured Marble Countertops
9. Division 22 for Plumbing Fixtures

1.02 REFERENCES

A. ASTM International (ASTM) Publications:

1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

B. Architectural Woodwork Institute (AWI) Publications:

1. "Architectural Woodwork Quality Standards"

C. Federal Specifications (FS) Publications:

1. FS MMM-A-130 - Adhesive, Contact

D. Code of Federal Regulations (CFR) Publications:

1. 40 CFR, Part 59, Subpart D 2001, "National Volatile Organic Compound Emission Standards for Architectural Coatings"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

C. Product Shop Drawings and Product Data: For each type of product specified.

1. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

a. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.04 QUALITY ASSURANCE

A. Tub/Shower surrounds, window stools, and lavatory/vanity countertops shall be supplied by one manufacturer. Where shown to be the same color, the color of the components shall match for all items. Refer to Interior Finish Index for colors.

B. Allowable Tolerances:

1. Variation in component size: +/- 1/8 inch.

2. Location of openings: +/- 1/8 inch from indicated location.

C. Perform work to (custom) quality in accordance with "Quality Standards" of the Architectural Woodwork Institute (AWI).

D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 PROJECT CONDITIONS

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

B. Field Measurements: Where cast polymer materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cast polymer materials work by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.07 SPECIAL WARRANTY

A. Cast polymer materials:

1. Provide one (1) year Warranty against manufacturing defects.

PART 2 PRODUCTS

2.01 CAST POLYMER

A. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:
    a. Simulated Tile Tub/Shower Surrounds:
        1) None.
2. Approved Manufacturers:
    a. Simulated Tile Tub/Shower Surrounds and Shower Bases:
        1) Mincey Marble Manufacturing Co. (800-533-1806)
        2) MPL Corporation (800-466-7465)
        3) MGroup (706-837-0008}
        4) International Mable Industries, Inc. (IMI) (770-928-2252)

B. Fire Hazard Ratings:
1. Classified in accordance local codes and ordinances, ASTM E84 and the following:
    a. Class A
    b. Flame Spread: [Class A: 0 - 25]
    c. Smoke Developed: 0-450
2. Subject to compliance with requirements, all products shall be permanently marked on the back side and provided with a temporary removable label on the front side with language clearly certifying compliance with ASTM E84 and indentifying the required Flame Spread Class Rating.

C. Tub/Shower Surrounds:
1. Homogeneous minimum 1/4" thick molded panels. Surrounds to be cast polymer wall panels; installed as indicated on Drawings. Provide one piece for each wall. Joints will be permitted at corners only. Sizes as shown on Drawings. Color as shown on Interior Finish Index.
    a. Surround Pattern:
        1) Provide custom pattern as shown on Drawings and Interior Finish Index.

2.02 SHOWER BASE STANDARDS

A. Cast Polymer Shower Bases shall comply with ANSI Z124.1.2. Types shall be standard and wheelchair accessible sizes and shapes as shown on Drawings. Color as shown on Toilet & Bath Accessory Matrix. Provide drain of size indicated with NPS 2 outlet. Floor shall have textured non-slip surface per ASTM 1028 and ASTM F462.

2.03 INSTALLATION MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Adhesive and Sealant (Installer to verify products are approved by Cast polymer materials Manufacturer):
1. Avendra, LLC Preferred Manufacturers:
    a. None

2. Approved Products: Provide only the following products unless approved in writing by the approved cultured marble manufacturer for the Project:

    a. Mincey Marble Manufacturing:

        1) Installation Adhesive: Mincey “Quick Grab” Cast Marble Adhesive

        2) Panel-To-Panel Sealant: Mincey Color Matched High Performance 100% Silicone

        3) Panel-to-Substrate Sealant: Mincey High Grade Siliconized Acrylic Latex

    b. MPL Corporation:

        1) Installation Adhesive: Liquid Nails LN-933

        2) Panel-To-Panel Sealant: GE Silicone II

        3) Panel-to-Substrate Sealant: Siliconized acrylic latex manufactured by DAP or Sherwin Williams.

    c. M Group

        1) Installation Adhesive: Liquid Nails LN-933 or Loctite PL-503

        2) Panel-To-Panel Sealant: GE Silicone II

        3) Panel-to-Substrate Sealant: GE Silicone II

    d. International Marble Industries, Inc. (IMI)

        1) Installation Adhesive: Titebond 7272 Construction Adhesive or Liquid Nails LN-933

        2) Panel-To-Panel Sealant: SilBond 4500 High-Strength Silicone Sealant manufactured by Silco, Inc.

        3) Panel-to-Substrate Sealant: Peri-Bond PB-3 siliconized acrylic latex, manufactured by Silco, Inc.

3. 40 CFR 59, Subpart D (EPA Method 24), or as listed in VOC limit tables in Section 01 81 19 “Indoor Air Quality Requirements”. Products furnished shall comply with whichever VOC content requirement is more stringent.

2.04 FABRICATION

A. General:

1. Shop assemble cast polymer materials for delivery to site in units easily handled and to permit passage through building openings.

2. 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.

    a. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.

3. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.

4. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

5. Provide for mounting of soap dishes, grab rails, etc., as indicated on the Drawings.

PART 3 EXECUTION

3.01 SHIPPING AND RECEIVING GUIDELINES

A. A certified forklift driver must be on site when offloading the cultured marble material.

1. Forklift must have 60” extensions and the load capacity of 5000 pounds or more. ‘Lull’ type lifts shall not be used to unload material. The manufacturer is not responsible for damage to material due to use of incorrect forklift or fork lengths.

a. Tow strap or chains are required with larger loads that may require having to pull skids out from the back of the truck.

b. Manufacturers may not ship on flatbeds unless requested. There may be an additional fee for flatbed use (more damage may occur when shipping on a flatbed due to the straps holding them on the truck).

2. Report any damage due to shipping within the period indicated by the manufacturer. Once it is unloaded from the truck and marked received in good condition, the material is now the **responsibility of the contractor** there after. Any concealed damage should be reported within the period indicated by the manufacturer. Make sure in that time the contractor pulls off the shrink wrap and inspects top and sides of panels. Most damage can be seen from these views immediately.

3. When handling products, the contractor must handle with care. The panels have some flex in them but like any fragile product the panels cannot be bent or expected to hold their weight if picked up incorrectly.

a. During hand unloading of the material, store the material in a flat, smooth place until all of the material has been removed from the crate/packaging. Once the crate/packaging has been emptied, place the crate/packaging in the area (make sure that this area is flat and smooth) that the material will be stored in until ready to install. After the crate/packaging has been re-located, place the material back inside the crate/packaging in the reverse order that it was removed from the crate/packaging. If possible, store the crate/packaging either inside a building or in a storage container. If this is not possible, the crate/packaing and its contents need to be covered with tarps to keep it from being exposed to the elements.

b. Panels should be carried upright like glass. Two people minimum are required to handle the panels.

4. When cutting panels, it is recommended that they are at room temperature 65 degrees or above. If the panels are stored outside in cold weather make sure to bring them inside for at least 24 hours before installation. Cold weather will make the panels brittle and may cause unnecessary breakage.

a. Cast marble material shall not be housed outside any longer than 30 days.

b. All cast marble shall be installed within 90 days regardless of storage location.

5. When storing panels make sure they are stored flat. If bowing does occur lay the panels on a flat surface and apply heat and weight to restore levelness.

3.02 INSPECTION

A. Verify adequacy of backing and support framing.

3.03 PREPARATION

A. Condition cast polymer materials to average prevailing humidity conditions in installation areas before installation.

3.04 INSTALLATION

A. All surrounds shall be installed as shown on Drawings and as specified by manufacturer.

B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

C. Tub/Shower Surrounds:

1. Remove all dust and other contaminants from the back side of all panels before installation.

2. Secure soap dishes to panels with adhesive as recommended by Manufacturer.

3. Hold bottom edge of wall panel above rim of tub and shower for application of sealant as shown on Drawings.

4. When cutting the panels use a circular saw with a diamond blade – cut them on the unfinished side; verify with manufacturer's instructions.

5. Do not use silicone to adhere the panels. A good grade of construction adhesive must be used. It takes 24 hours for the construction adhesive to set. Instead of braces, one can dab hot glue on the wall to hold the panel in place (apply pressure on the panel where the hot glue dabs have been placed, when the heat goes away the panel is secure). Use recommended glue per manufacturer's requirements. A pure silicon caulking is used where one panel touches another panel, tub shower base, or the wall.

6. When installing grab bars, blocking should always be placed in the proper location prior to the wall substrate being installed. Panels are not typically designed to support the tension placed on the bar. Once panels are installed, all screw holes must be pre-drilled through the panels large enough so that no screw threading comes in contact with the panel. This will prevent damage to the panel. Tighten all screws carefully, the panels can be cracked or broken if over-tightened.

D. Shower Pans:

1. Verify that the subfloor is level prior to installation. If floor is not level, provide float finish or another suitable material.

2. Do not use the integral flanges or leak-proof fiberglass flanges to lift or handle the pan; they are not handles. It is critical that these do not get damaged or broken during installation.

3. After setting the pan per manufacturer's instructions, all four corners and the diagonals must be checked for levelness. Shim as necessary to eliminate any movement.

4. The pan must be set prior to installation of surround wall substrates.

3.05 ADJUSTING AND CLEANING

A. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.

B. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Owner's Representative's satisfaction.

END OF SECTION

SECTION 06 82 00

GLASS-FIBER-REINFORCED PLASTIC

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fiber reinforced plastic (FRP) panels
2. Accessories
3. Adhesives
4. Sealants for use with FRP Panels

B. Related Sections:

1. Section 07 92 00 – Joint Sealants
2. Section 09 21 16 - Gypsum Board Assemblies.

1.02 REFERENCES

A. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

C. Product Data and Shop Drawings: For each type of product specified.

1. Product Data indicating component profiles and fastening and joining details.
2. Shop Drawings:
   a. Show locations and panel layouts; materials and finishes; panel size, thickness and color.
   b. Trim locations and types.
   c. Anchorage type and spacing.
   d. Installation methods; joint treatments; relationships with adjacent construction; and other pertinent information.
3. Samples: Each product specified.

1.04 QUALITY ASSURANCE

A. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the Work of this Section.

B. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to job site in unopened containers bearing manufacturer's name and content identification.

B. Store materials as recommended by the manufacturer.

C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 PROJECT CONDITIONS

A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.

B. Environmental Limitations: Do not deliver or install Fiber reinforced plastic (FRP) panel materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1. Acclimatize panels 48 to 72 hours prior to installation.

C. Field Measurements: Where Fiber reinforced plastic (FRP) panel materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support Fiber reinforced plastic (FRP) panel materials work by field measurements before being enclosed and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.01 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. “Marlite FRP”; Marlite (330-343-6621)

2. “Glasbord FSI”; Crane Composites, Inc., A Crane Co. Company (Formerly Kemlite Co.) (800-435-0080)

2.02 MATERIALS

A. Fiberglass Reinforced Polyester Panels:

1. Flat with embossed pebble surface texture; moisture resistant and impervious to mold and mildew, conforming to Fedspec L-P-505 and PS53.

2. USDA approved.

3. Meet FDA requirements.

4. Surface Burning Characteristics: ASTM E84, Class C/III.

a. Flame Spread: 100 or less.

b. Fuel Contributed: 100 or less.

c. Smoke Developed: 100 or less.

5. Size: 0.090" (3/32) thick x 4' x 8'.

6. Color: As shown on Interior Finish Index.

2.03 ACCESSORIES

A. Moldings:

1. PVC trim moldings by panel manufacturer.
2. Include inside and outside corners, end caps, cap edging, and division bars.
3. Color to match panels.

B. Anchors

1. Manufacturer's standard nylon drive rivets suitable for anchoring to substrate shown on Drawings.

2.04 ADHESIVE

A. Type recommended by panel manufacturer.

2.05 SEALANT

A. Clear silicone sanitary sealant type recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas in which work is to be performed. Report in writing to General Contractor all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Starting work constitutes acceptance of the existing conditions.

3.02 PREPARATION

A. Surface preparation:

1. Surface to which panels are to be applied must be smooth, solid.
2. Clean surface of dirt, dust, grease or other matter which might interfere with adhesive bonding of panels to substrate.

B. Pre-Sizing:

1. Prefit each panel before installing.
2. Cut as required to closely and neatly fit obstructions, nonstandard panel spacing, and penetrations.
3. Maintain 1/8" around pipes, electrical fittings, obstructions, and other items penetrating panels, to allow for expansion.

3.03 INSTALLATION

A. Install panels and moldings in accordance with manufacturer's written instructions.

1. Adhesive Application:
   a. Apply adhesive over entire back surface of panel using 3/16" V notched trowel.
   b. Adhesive coverage: 60 sq. ft. per gallon, or;
2. Cohesive Method:
   a. Skim coat adhesive on panel back and substrate.
   b. Fan panel to verify bonding to substrate and adhesive curing time after installation.

B. Install panels with edges vertical and plumb. Use maximum length pieces for minimum number of end joints.

C. Predrill panel fastener holes slightly oversize to accommodate panel expansion to contraction.

D. Secure upper and lower panel ends with nylon drive rivets, or with other non-corroding mechanical fasteners recommended by panel manufacturer.

1. Space fasteners at 16" o.c.

2. Drive fasteners to snug fit, but do not over tighten.

E. Install and seal trim concurrently with panel installation.

F. Remove excess sealant during installation, or carefully trim off excess after sealant has cured.

G. Seal joints and seams between panels or moldings and floor or base, ceiling, walls and penetrations.

3.04 CLEANING

A. Remove labels, stains, and excess sealant.

B. Clean panels using materials and methods recommended by manufacturer.

END OF SECTION

SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Foam-plastic board insulation.
   2. Glass-fiber blanket insulation.
   3. Spray polyurethane foam insulation.
   4. Vapor retarders.

B. Roof insulation is specified under EPDM Roof Membrane (Section 075323).

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product test reports.

C. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.

2.2 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corporation.
   2. Johns Manville.
   3. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.3 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Dow Chemical Company (The).
      b. Henry Company.
      c. Tiger Foam.
   2. Minimum density of 1.5 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).

2.4 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

B. Foil vapor retarder: Johns-Manville FSK-25 Cap Sheet

C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units according to manufacturer's written instructions.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For wood-framed construction, install blankets according to ASTM C.

C. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 INSTALLATION OF VAPOR RETARDERS

A. Place foil vapor retarders on pool side of pool room, pool equipment room, pool storage room, and pool restroom walls; and on underside of framing above the Pool Room. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation. Vapor retarders shall form a continuous airtight barrier around these rooms (walls and ceilings) by lapping as below.

B. Seal joints in vapor retarders by lapping no fewer than two studs or 32 inches, whichever is greater.
1. Fasten vapor retarders to wood framing in walls at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION 072100

SECTION 072113

FOIL FACED INSULATING SHEATHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Rigid polyisocyanurate foam board insulation with aluminum facers applied to exterior wall assembly between framing or CMU and finish material.

B. Fasteners, tape, adhesives, and sealants necessary for a complete installation.

1.2 WORK SPECIFIED IN OTHER SECTIONS

A. Division 05 Section 054000, “Cold Formed Metal Framing,” for cold formed metal framing supported wall assemblies utilizing rigid polyisocyanurate foam board insulation.

B. Division 06 Section 061600, “Sheathing,” for substrate materials for rigid polyisocyanurate board foam insulation.

1.3 SUBMITTALS

A. Make submittals in accordance with requirements specified in Division 01 Section 013300 “Submittal Procedures.”

B. Product Test Reports: Submit evaluation reports published by independent laboratory indicating evidence of compliance with specified criteria.

C. Product Data: Submit product data for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics: Mark products with readily identifiable mark from recognizable testing agency indicating compliance with ASTM E84.
   1. [Flame spread 25 or less.]

1.5 STORAGE AND HANDLING

A. Comply with Manufacturer’s recommendations for the proper storage and handling of insulation materials.

B. Store materials off of ground, protected from physical damage, and covered or otherwise shielded from sunlight.

C. Protect insulation so that insulation does not come in direct contact with rain, snow, or other moisture sources.

PART 2 - PRODUCTS

2.1 POLYISOCYANURATE RIGID FOAM BOARD INSULATION

A. Foil Faced Polyisocyanurate Foam Board Insulation: High performance rigid cellular foam board complying with ASTM C1289 **Type I, Class 1** consisting of an ASTM E84**[Class A]** closed cell polyisocyanurate foam core laminated between a coated foil facer on front side of board and a reflective foil facer on the back side of the board.

1. Basis of Design Product: Subject to compliance with the documents, provide **[Atlas Roofing Corporation "Energy Shield** or comparable product**[s]** by one of the following:
   a. Carlisle Coatings and Waterproofing.
   b. Dow.
   c. Hunter Panels.

2. Provide aluminumfaced polyisocyanurate insulation with the following thickness and R-value**:1.2 inch (31 mm) thick; R-7.5**
3. Facer Materials: Class A durable reflective aluminum facer on each face of insulation.
4. Moisture Vapor Transmission: Less than 0.3 when tested in accordance with ASTM E 96, Desiccant Method.
5. Compressive Strength:Grade 3 when tested in accordance with ASTM C 1289.
6. Water Absorption: Less than 1% by volume when tested in accordance with ASTM C 209.
7. Dimensional Stability: Less than 1% linear change when tested in accordance with ASTM D 2126.
8. Service Temperatures: -100ºF to + 250ºF (-73ºC to +122ºC)
9. Potential Heat:12,000 Btu/lb.
10. Auto-Ignition Temperature: 800ºF

2.2 ACCESSORIES

A. Insulation Adhesive: High strength, heavy-bodied, thermoplastic rubber adhesive formulated to bond insulation to metal, concrete or masonry surfaces.

1. Product: Subject to compliance with the requirements, provide one of the following:
   a. AGM Industries GPA-72 Adhesive.
   b. Loctite PL 300 VOC.
   c. BASF Sonneborn Premium Adhesive
   d. Other products approved in writing by the board insulation manufacturer.

B. Mechanical Fasteners: Low profile, 2 inch (50 mm) diameter high-density polypropylene washer and screw assembly designed specifically to fasten insulation board to designated substrate.

1. Product: Subject to compliance with the requirements, provide one of the following.
   a. Rodenhouse, Inc. fasteners as approved in writing by the fastener manufacturer for the intended substrate.
   b. Wind-Lockfasteners as approved in writing by the fastener manufacturer for the intended substrate.
   c. Other products approved in writing by the board insulation manufacturer.

C. Joint Sealant: Single component, non-shrink joint sealants and backings which are compatible with each other and with other materials in the assembly.

1. Product: Subject to compliance with the requirements, provide one of the following:
   a. Sikaflex-1A and 2C NS
   b. PecoraDynotrol I & II

c. Sonneborn NP1 & NP
d. Dow 790, 791, 795
e. GE Silpruf, Silpruf LM
f. Pecora 890, 895
g. Loctite PL 300 Foamboard adhesive.
h. BASF Sonneborn Premium Adhesive.
i. Other joint sealant approved in writing by the insulation board manufacturer.

D. Expanding Foam Sealant:Single component, non-shrink, Class A polyurethane insulating closed cell foam that is compatible with insulation board; Complies with ASTM E814 Standard Test Method for Fire Tests of Through-Penetration Fire Stops; air and vapor permeance not greater than insulating board.
1. Product: Subject to compliance with the requirements, provide one of the following:
a. Dow Great Stuff Pro Gaps & Cracks Insulating Foam Sealant.
b. FOMO Products, Inc.; Handi-Foam Fireblock Sealant.
c. Other products approved in writing by the insulation board manufacturer.

E. Joint Tape: Minimum 2 mil thick x 3 inch (76 mm) wide, high strength aluminum foil coated tape with high temperature acrylic adhesive intended for adhesion to foil substrate.
1. Product: Subject to compliance with the requirements, provide one of the following:
a. IPG Cold Weather Aluminum Foil Tape.
b. Atlas Roofing Corporation WRB Tape.
c. Other products approved in writing by the insulation board manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect areas to receive insulation. Ensure that substrates intended for adhesive fastening are clean and free from moisture or other materials that may have a deleterious effect on adhesion. Prepare report identifying conditions that may be detrimental to the performance of the insulation and proceed with installation only after the conditions noted have been properly addressed.

3.2 INSTALLATION

A. General:
1. Comply with manufacturer's instructions for installation of polyisocyanurate rigid foam board insulation.
2. Do not install polyisocyanurate rigid foam board insulation that has become soiled, wet, or has not been properly protected from sunlight.
3. Dry fit polyisocyanurate rigid foam board insulation prior to final installation. Neatly trim board around conduits, pipes, and other items that will penetrate board insulation.

B. Adhesive Attachment (over CMU):

1. Apply 3 inch diameter dabs of adhesive spaced no greater than 24 inches (610 mm) on center in both directions. At perimeter edges and at openings, apply additional continuous ribbon of adhesive no greater than 3 inches (76 mm) from edge of board or opening in board.

2. Before adhesive skims over, align board and press insulation board on to substrate, applying an even, medium pressure to spread adhesive and remove air pockets.

C. Mechanical Attachment (over studs):
1. Fasten insulation board to substrate with mechanical anchors, with anchors evenly spaced no greater than 24 inches (610 mm) on center in both directions. At perimeter edges and at openings, install fasteners at maximum 24 inches (610 mm) on center, and no greater than 4 inches (101 mm) from edge of board or opening in board. The washer of a single 1 ¾ inch washer style fastener may be used to bridge adjoining boards.

3.3 ACCESSORIES

A. Joint Sealant: For joints, gaps, and openings less that ½ inch (13 mm) wide, install continuous bead of joint sealant. Provide backer rod as required to prohibit joint sealant from bonding to a third surface.

B. Expanding Foam Sealant: For joints, gaps, and openings greater than ½ inch (13 mm) wide, install sealant in a continuous ribbon between adjacent board edges, working sealant in to joint for a full depth bead of sealant.

C. Tape: Install tape evenly between adjacent boards in continuous pieces using longest practicable lengths. Where splices are required, provide laps no less than 6 inches (150mm).
1. Install tape centered over horizontal and vertical joints.
2. Start taping at lowest condition. Tape horizontal joints first and then vertical joints up the building. Ensure tape is installed in shingle-like fashion and that horizontal seams are taped first where horizontal and vertical tapes intersect.
3. Firmly roll tape with "J" roller to remove air pockets and to ensure complete attachment of tape to insulation board.

3.4 PROTECTION

A. Protect polyisocyanurate rigid foam board insulation from excess moisture, mechanical damage, and exposure to open flame.

B. Promptly repair damage caused to insulation in a manner that retains integrity and continuity of insulation and facer materials.

C. Cover insulation with cladding promptly, but no later than 180 days after installation of insulation.

END OF SECTION

SECTION 072419

WATER DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Water Management Exterior Insulation and Finish Coating Systems Application with secondary air/moisture barrier system as described and specified herein.

B. Related Sections:

1. Section 06 10 00 - Rough Carpentry
2. Section 07 20 00 - Thermal Protection
3. Section 07 62 00 - Sheet Metal Flashing and Trim
4. Section 07 92 00– Joint Sealants

1.02 REFERENCES

A. ASTM International Publications:

1. B117 "Standard Practice for Operating Salt Spray (Fog) Apparatus"
2. C150 “Standard Specification for Portland Cement“
3. C1177/C1177M “Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing”
4. C1397 “Standard Practice for Application of Class PB Exterior Insulation and Finish Systems”
5. C1481 “Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS)"
6. D1784 “Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds”
7. D4258 "Standard Practice for Surface Cleaning Concrete for Coating"
8. D4261“Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating”
9. E 84 "Standard Test Method for Surface Burning Characteristics of Building Materials"
10. E331 “Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference”
11. E2098 “Standard Test Method for Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish Systems (EIFS), after Exposure to a Sodium Hydroxide Solution”
12. E2110 “Standard Terminology for Exterior Insulation and Finish Systems (EIFS)”
13. E2273 “Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies”
14. E2430 “Standard Specification For Expanded Polystyrene (“EPS”) Thermal Insulation Boards For Use In Exterior Insulation and Finish Systems (“EIFS”)
15. E2485 “Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings “
16. E2486 “Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS)”

17. E2568 “Standard Specification for PB Exterior Insulation and Finish Systems”
18. E2570 “Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage”

B. Gypsum Association (GA) Publications:
1. GA-253 "Recommended Specifications for the Application of Gypsum Sheathing"

C. International Code Council (ICC)

D. ICC Evaluation Service Reports:
1. AC235 “Acceptance Criteria for EIFS Clad Drainage Wall Assemblies”

E. National Fire Protection Association (NFPA) Publications:
1. 268 “Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source”
2. 285 “Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components”

1.03 DEFINITIONS

A. Class PB Exterior Insulation and Finish System (EIFS), per ASTM E2110 are systems applied over insulation board, in which the base coat ranges from not less than 1 /16 in. (1.6 mm) to 1/4 in. (6.4 mm) in dry thickness, depending upon the number of nonmetallic reinforcing mesh layers encapsulated in the base coat. The base coat is then covered with a finish coat of various thickness in a variety of textures and colors.

B. Water-Drainage Exterior Insulation and Finish System (EIFS): EIFS with a means that allows moisture entering into an EIFS assembly to drain to the exterior.

1.04 SYSTEM DESCRIPTION

A. Design Requirements:
1. Polymer-based protective coating 100% pure acrylic resin based materials. No materials using non-acrylic resins in their formulas will be accepted.
2. Exterior insulation and finish system refers to a non-structural exterior wall assembly composed of the following components:
   a. An approved substrate.
   b. An approved air/water-resistive barrier compatible with substrate and with adhesively attached insulation system.
   c. UV treated PVC perforated Drainage track.
   d. Thermal insulation board adhesively attached to the air/water resistive barrier. Polyethylene, self-adhering flashing tape or fluid applied / reinforced flexible flashing compatible with substrate coatings.
   e. A reinforced base coat applied to the insulation board.
   f. A 100% acrylic based textured coating applied over the reinforced base coat.
   g. Approved sealants are required at all dissimilar materials as well as EIFS to EIFS expansion and control joints, and are specified in Section 07 92 00.

B. Performance Requirements:
1. General: Provide systems that comply with the following performance requirements:
   a. Bond Integrity: Free from bond failure within EIFS system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.

b. Weather tightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind it, including substrates, supporting wall construction, and interior finish, and including a means that allows water entering into an EIFS assembly to drain to the exterior.

c. Water Penetration: No water penetration when tested in accordance with ASTM E331.Moisture Resistance: No deleterious effects after 14 days when tested in accordance with ASTM D 2247.

d. Drainage: Greater than 90% drainage efficiency when tested in accordance with ASTM E2273.

e. Salt Spray Resistance: No deleterious effects after 300 hours when tested in accordance with ASTM B117.

f. Freeze/Thaw: No deleterious effects when tested in accordance with ASTM E2485. Mildew Resistance: No growth supported during 28 day exposure period when tested in accordance with ASTM D3273 and evaluated according to ASTM D3274.

2. Impact Resistance ASTM E2486:

a. From grade to 2nd floor, a minimum 90-150 inch/pounds impact system is required.

b. From 2nd floor up to a minimum 50-89 in/lb impact system is required.

1.05 SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) with the following supporting data:

1. Product Data: Submit technical product data, test reports, installation instructions and recommendations from manufacturer, including data that materials comply with requirements.

2. Submit one 1 ft. x 1 ft. sample of the wall system for each finish, color, and texture selected using same tools and techniques as for the actual project.

3. Shop Drawings: Show installation of system including plans, elevations, sections, details of components, joint locations and configurations within system and between system and construction penetrating it, termination details, and attachments to construction behind system which are project-specific.

4. Certifications:

a. Manufacturer's written certification of installer as qualified to install manufacturer's system using trained workers.

b. Certification that materials meet or exceed requirements.

c. Provide manufacturers applicable code compliance report stating that the EIFS as installed has been tested per local Code requirements and does not affect the fire rating of the exterior wall assembly.

B. Field-Constructed Mock-Up: Prior to installation of exterior insulation and finish systems, erect mock-ups for each form of wall construction, including typical caulked joints and/or rustication type joints, etc., and finish required to verity selections made under sample submittals. Build mock-ups to comply with the following requirements, using materials indicated for final work:

1. Locate mock-ups on site in location and of size indicated or, if not indicated, as directed by the Owner's Representative.

2. Obtain the Architects acceptance of mock-up's visual qualities before start of final work.

C. Closeout Submittals:

1. Affidavits from EIFS and sealant applicators confirming full compliance to all manufacturers' application requirements.
2. Copies of all "Field Observation Reports" from the EIFS manufacturer representative shall be submitted as an attachment to the EIFS warranty.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. The Applicator, and Insulation Board Manufacturer shall be approved by the manufacturer in writing on company letterhead. Attach this letter to warranty.
2. The manufacturer shall be a member of the Exterior Insulation Manufacturer's Association - EIMA.
3. The manufacturer shall have manufactured Exterior Insulation and Finish Systems in the United States for at least five years.
4. The installer shall have had a minimum of five years experience under the same company name or organization installing the specified product on projects similar in scope, and with a record of successful in-service performance.

B. Design and Detailing:
1. The Manufacturer's approved Applicator shall verify that the proposed Substrate is acceptable type prior to the application of the System.
2. The System shall be installed in accordance with manufacturer's published details and specific recommendations for this project.

C. Approvals, Listings, and Classifications:
1. Fire-Test-Response Characteristics: Provide system assemblies and components with the following fire-test-response characteristics as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting agency.
a. Insulation Board: Flame Spread Index of 25 or less and a Smoke Developed Index of 450 or less when tested individually per ASTM E84.
b. Finish Coats: Flame Spread Index of 25 or less and a Smoke Developed Index of 450 or less when tested individually per ASTM E84.
2. Code Approvals:
a. The EIFS system shall maintain a research report with the applicable building codes and agencies within the jurisdiction of the Project. Code compliance must be based on full scale diversified fire testing in its end use configuration by independent agencies whose classifications and requirements have general acceptance as regulator.
b. The EIFS system shall meet or exceed the Energy Standards as set by the applicable building codes and agencies within the jurisdiction of the project. Coordinate all applicable installation conditions and detailing as required to accommodate thickness of exterior continuous insulation that are required by applicable energy codes.
c. The System shall be evaluated, listed, and classified as described in the following documents:
1) ICC Research Report
2) Local Approval

D. Pre Installation meeting: The EIFS installer's foreman or superintendent for this project and a representative of the EIFS system manufacturer shall attend the Pre-installation meeting prior to the start of the EIFS application.

E. The engineered and tested performance of the EIFS shall be the sole responsibility of the EIFS manufacturer. The EIFS installer shall comply with the manufacturer's recommendations.

F. Field Observations and Inspections

1. The General Contractor shall coordinate with selected EIFS manufacturer representative for interim site visits to perform “Field Observations” at appropriate milestone stages of the EIFS application or as necessary to review detailing or installation questions.

a. The manufacturer’s representative shall provide final “Field Observation” at the completion of application of the system including contiguous sealant joints.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturer's labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from the weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Protect coatings delivered in pails from freezing and temperatures in excess of 90°F. Store away from direct sunlight.
2. Protect bagged Portland cement based materials from moisture and humidity. Store under cover and off the ground in a dry location.
3. Stack insulation board flat and off the ground.
4. Protect plastic insulation against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
5. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.08 PROJECT CONDITIONS

A. Environmental Limitations: Do not install system when ambient outdoor air and substrate temperatures are 40 deg F and falling unless temporary protection and heat are provided to maintain ambient temperatures above 40 deg F during installation of wet materials and until they have dried thoroughly and become weather resistant, but for at least 24 hours after installation of Air/Water resistive barrier and EIFS.

B. Adjacent materials and the wall system shall be protected during installation, while curing and/or unattended, from weather and other damaging conditions.

1.09 COORDINATION

A. The work of this Section shall be coordinated with the work specified in related Sections.

B. Provide site grading such that the EIFS terminates above finished grade a minimum of 8 inches or as required by governing code.

C. Coordinate installation of foundation waterproofing, roofing membranes, windows, doors and other wall penetrations to provide a continuous air/moisture barrier.

D. Coordinate location of system terminations at adjoining materials and around penetrations to provide a minimum joint size as required by the system manufacturer for application of sealant to a width of 3/4 inches but no less than ½ inches.

E. Provide protection of rough openings through walls per IBC requirements prior to installation of windows, doors and other items which penetrate the exterior walls.

F. Coordinate installation of windows and doors so air/moisture barrier components are installed per manufacturer's recommendations and details.

G. Install window and door head flashing immediately after windows and doors are installed.

H. Install diverter flashings wherever water can enter the wall assembly to direct water to the exterior.

I. Install copings and sealant immediately after installation of the EIFS and when EIFS coatings are dry.

J. Attach penetrations through EIFS to structural support and provide water tight seal at penetrations. Follow EIFS manufacturers recommendations on fastening through the System.

K. Temporary protection shall be provided during the wall system application and prior to the installation of the sealant and flashing systems at all locations that could allow moisture penetration. Do not allow water to penetrate behind EIFS.

L. All joints to be sealed shall be done immediately after completion of field applied wall system.

M. The tops of all walls must immediately be covered with either the final trim or temporary protection to prevent water infiltration behind the system. Coping shall be installed as soon as possible after the installation of the system.

1.10 MAINTENANCE

A. Maintenance Kit:

1. Supply maintenance kit and store at site where directed by Owner's Representative.
    a. Containers of liquids shall be unopened.
2. Maintenance kit shall contain the following components:
    a. Printed maintenance instructions
    b. One gallon of adhesive
    c. Minimum one gallon of finish color coating for each color used
    d. 32 square feet of each type reinforcing fabric
    e. 32 square feet of insulation board

1.11 WARRANTY

A. EIFS Manufacturer:

1. The EIFS manufacturer shall provide a minimum 10-year limited warranty on the labor and materials associated with the EIFS and 10 year materials and labor moisture drainage warranty. This warranty is exclusive of flashings and shall not be limited for fade resistance or depreciation.
    a. EIFS Materials and System are warrantied against:
        1) Material defects, including, but not limited to, fading, peeling, cracking, delamination, flaking, or similar failures.
        2) Seepage and leakage of water or excessive moisture into the building or wall cavities through a material defect in the Water Drainage EIFS system.

B. EIFS Installer:

1. The EIFS installer shall provide a minimum 3-year warranty for all workmanship related to the EIFS application.
2. EIFS Installation shall be warranted against:

a. Failure in an EIFS system component or overall performance including but not limited to

1) Seepage and leakage of water or excessive moisture into the building or wall cavities through improper material mixing or material curing, failure to provide proper protection or installation within temperature limitations.

2) Application not in accordance with contract documents and/or EIFS manufacturer's recommendations for the Water Drainage EIFS system.

PART 2 PRODUCTS

2.01 MANUFACTURERS

Approved Manufacturers:

1. Stotherm CI Essence System, Sto Finish Systems (888-786-3437)
2. "Senerflex Channeled Adhesive Design" System; BASF Wall Systems (800-221-9255).
3. "Outsulation Plus MD EIFS; Dryvit Systems, Inc. (800-556-7752)
4. "Parex Optimum WaterMaster EIFS"; Parex USA (866-516-0061)

2.02 GENERAL:

A. All components of the wall system shall be obtained from one manufacturer. No substitutions or addition of other materials will be allowed.

2.03 MATERIALS

A. Compatibility: Provide substrates, air/moisture barrier, integrated flashing, drainage accessories, adhesive, board insulation, reinforcing meshes, base- and finish-coat materials, and sealants that are compatible with one another and approved for use by system manufacturer for Project.

B. Air/Moisture Barrier: A ready mixed acrylic based, fiber reinforced, water-resistive coating.

1. Install layer of air/water resistive to completely cover sheathing before installation of EIFS system.
2. Air/water resistive Barrier System Accessories: For use at substrate joints and at openings in the substrate and penetrations through the substrate.
   a. Joint Treatment: ready mixed acrylic based, flexible joint compound as recommended by the manufacturer for use the air/moisture barrier.
   b. Flashing Tape: Self-adhesive type as recommended by the manufacturer for use with the air/moisture barrier system.
   c. Flashing Tape Surface Conditioner: As recommended by manufacturer for use with system flashing tape.
   d. Flexible Flashing Materials: Ready mixed, fluid applied with integral reinforcing mesh scrim flexible flashing material; EIFS manufacturer's standard.

C. Insulation Board:

1. Molded-Expanded-Polystyrene Board Insulation: Rigid, cellular thermal insulation formed by expansion of polystyrene resin beads or granules in a closed mold. Comply with system manufacturer's requirements, ASTM C578 for Type I, and ASTM E2430 for more stringent requirements for material performance and qualities of insulation, including dimensions and permissible variations, and the following:
   a. Before cutting and shipping, age insulation in block form by air drying for not less than six weeks or by another method approved by EIMA that produces equivalent results.

1) Nominal 1.0 pcf, of the thickness and shape as shown on the Drawings.
2) Flame spread and smoke development shall be less than or equal to 25 and 450 respectively when tested by ASTM E84.
3) Minimum thickness shall be as shown on Drawings and not less than 1".
4) Maximum thickness: Per building code requirements.
5) Labeling and quality control shall comply with the building code.

D. Adhesive: Factory blended, polymer based adhesive as recommended by the system manufacturer to be compatible with the substrate and insulation being utilized.

E. Reinforcing Mesh: Balanced, alkali-resistant, interlaced open-weave glass-fiber mesh treated for compatibility with other system materials, made from continuous multi-end strands with retained mesh tensile strength of not less than 120 lbf/in per ASTM E2098 complying with ASTM D578 and the following requirements for minimum weight:

1. Standard weight, as recommended by manufacturer to meet "Standard Impact Resistance" not less than 4.3 oz.
2. Intermediate weight, as recommended by manufacturer to meet "Medium Impact Resistance", not less than 6 oz.
3. Heavy weight as recommended by manufacturer to meet "Ultra-High Impact Resistance" in locations as shown on Drawings, and as selected below, not less than 20 oz..

F. Base-Coat Materials: Factory blended, polymer based base coat as recommended by the system manufacturer to be compatible with the EPS insulation board and reinforcing mesh.

G. Finish Coat: Materials System manufacturer's standard mixture, complying with the following requirements for material composition and method of combining materials:

1. Factory mixed acrylic polymer emulsion texture finish with color fast mineral pigments forming integral finish color.
2. Colors: Refer to Exterior Finish legend and notes
3. Textures: Refer to Exterior Finish legend and notes
    1) Fluid Nozzle shall be #66SS
    2) Air Nozzle shall be #66SD

b. Installation Contractor: Shall be trained and listed with the EIFS manufacturer for proper bidding, coordination and installation of metallic pearlescent coating.

H. Cement: Type I Portland Cement, ASTM C150.

I. Water:

1. Water shall be clean and potable. Water shall be tested by the installer for excessive levels of iron and all other potentially damaging substances prior to its incorporation in accordance with the manufacturer's published instructions.

J. Mechanical Fasteners: System manufacturer's recommended corrosion-resistant fasteners consisting of thermal cap, standard washer and shaft attachments, and fastener indicated below; selected for properties of pullout, tensile, and shear strength required to resist design loads of application indicated; capable of pulling fastener head below surface of insulation board.

K. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with system manufacturer's written requirements, complying with ASTM C1063.

1. Drainage/Starter Track: UV Treated PVC Perforated "J" channel with weep holes, complying with ASTM D1784 and ASTM C1063.

L. Elastomeric Sealant Products: Provide system manufacturer's listed and recommended chemically curing, elastomeric sealant that is in accordance with ASTM C1382 and compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C1481 “Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS)" and with requirements in Section 07 92 00 “Joint Sealants" for products.

1. Colors as selected by the Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to application of the wall system, the substrate shall be examined by the installer for compliance with the Contract Documents and manufacturer's specifications. The Contractor and Owner’s representative shall be advised of all discrepancies. All substrates shall be free of surface and excessive internal moisture. Work shall not proceed until unsatisfactory conditions are corrected.

1. Inspect sheathing application for compliance with GA-253.

3.02 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.

C. Prepare and clean substrates to comply with system manufacturer's written requirements to obtain optimum bond between substrate and adhesive for insulation.

1. Apply primer-sealer over substrates where required by system manufacturer for improving adhesion or for protecting substrates from degradation.

3.03 INSTALLATION

A. Comply with ASTM C1397 and system manufacturer's written instructions for installation of system as applicable to each type of substrate indicated.

1. Avoid all sources of open flame in immediate are of application.
2. Under no circumstances shall accelerators, retarders, or other admixtures be used.
3. Use clean non-metal container, free of all foreign substance, for mixing and preparing material. Do not use container which has been used for or cleaned with a petroleum product.

B. Install Air/water resistive Barrier in accordance with EIFS manufacturer's instructions.

C. Install flashings and drainage accessories over Air/water resistiveBarrier at all openings, penetrations, and other locations as recommended by EIFS manufacturer, to comply with EIFS manufacturer’s instructions.

D. Attach insulation to substrates to comply with ASTM , system manufacturer’s written requirements, and the following:

1. Apply boards over dry substrates in courses.
2. Joints:
    a. Stager vertical joints in successive courses to produce running bond pattern.

1) Offset joints of insulation from joining in sheathing.

b. EIFS to ElFS expansion joints, vertical or horizontal: Install insulation board with a clear ¾" space prior to backwrap application. The finish joint shall be ½" clear space to receive sealant. Provide vertical expansion joints at a maximum 70'-0" within EIFS (keep substrate continuous).

c. EIFS to EIFS expansion joints where building frame has expansion joints or underlying substrate will have localized movement.

1) Horizontal expansion joints at floor lines where localized shrinkage of solid wood floor framing members is anticipated.

2) Expansion joints within building structural frame: Same basic installation as an EIFS to EIFS expansion joint above. The width of sealant join is a function of pre-determined expansion joint size. The finish joint width should be ¾ inches or 4 times the anticipated joint movement, whichever is greater.

d. EIFS to Dissimilar materials: (windows, doors, louvers, etc where anticipated movement of sealant joint is static. Installation board shall be installed with a clear 3/4" space prior to the backwrap application. Finish sealant joint width to be minimum 1/2" wide.

e. EIFS to Dissimilar materials (strip windows, or louvers etc. where the anticipated movement of sealant joint is dynamic). Similar condition to EIFS to EIFS where movement is anticipated. The width of sealant joint is a function of overall calculated movement of the step window or louvers. The finish joint width should be 4 times the anticipated joint movement.

3. Interlock ends at internal and external corners.

4. Rasp or sand flush any irregularities projecting more than 1/32" from surface of insulation; do not create depressions deeper than 1/16". Fill all gaps within insulation boards greater than 1/16" with slivers of EPS.

5. Cut insulation to fit openings, corners, and projections and to produce edges and shapes conforming to details indicated.

6. Sealants shall be applied to reinforced base coat only. Application to finish coat will not be acceptable.

7. Treat exposed edges of insulation board by encapsulating with base coat, reinforcing fabric, and finish coat.

8. Coordinate flashing installation with installation of insulation.

E. Apply base coat to exposed surfaces of insulation in thickness specified system manufacturer.

1. Minimum thickness of base coat to be sufficient to embed reinforcing mesh, or as required by system manufacturer.

2. Prior to application of base coat, rasp surface of EPS insulation board to remove yellow dust deposits resulting from excessive UV exposure.

F. Fully embed reinforcing fabric of weight indicated below in wet base coat to produce wrinkle free installation so that no mesh color or pattern is visible: Follow system manufacturer's instructions for reinforcing mesh application.

1. Fabric Weight: Standard Impact Resistance, unless otherwise indicated High-Impact Resistance: From ground level to minimum 8'-0" high, at all corners of doors and windows, all column surrounds and in other locations as shown on Drawings.Mesh to be continuous at corners and overlapped not less than 2-1/2". Do not lap reinforcing mesh within 8" of corners.

G. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a uniform finish of texture and color matching approved sample.

3.04 MASONRY AND CONCRETE CEMENTITIOUS COATING ("DFS")

A. Remove surface contaminants per ASTM D4258 and D4261.

B. Repair surface defects including honeycombs, voids or pitted areas with approved patching material.

C. Repair surface cracks per manufacturers recommendations.

D. Apply surface conditioner to chalking or absorbent surfaces.

E. Skim coat entire surface with leveler material to fill all voids and make all mortar joints flush with the surface.

F. Inspect surface to ensure there will be no telegraphing of surface defects to finish coating.

G. Apply finish coating to primed surfaces in strict accordance with manufacturer's specifications.

3.05 INSTALLATION OF JOINT SEALANTS

A. Prepare joints for sealants, of type and at locations indicated, to comply with applicable requirements in Section 07 92 00 (07920) "Joint Sealants" and in ASTM C1481.

1. Clean surfaces to receive sealants to comply with indicated requirements and system manufacturer's written instructions.
2. Joint sealants to be applied after base coat has cured but before applying finish coat.

3.06 CLEANING AND PROTECTING

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive system coatings.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer and system manufacturer that ensure system is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 072500

WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Building wrap.
   2. Flexible flashing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
   1. Products: Subject to compliance with requirements, provide the following:
      a. DuPont (E. I. du Pont de Nemours and Company); Tyvek Commercial Wrap or StuccoWrap as recommended by exterior wall finish manufacturer.
   2. Water-Vapor Permeance: Not less than 50 g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
      b. Protecto Wrap Company; BT-25 XL.
      c. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.

B. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
2. Lap flashing over water-resistive barrier at bottom and sides of openings.
3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 072500

SECTION 074213

METAL WALL AND SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap-seam metal wall and soffit panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference:

1. Meet with Owner, Architect, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 3" = 1'-0"

C. Calculations:

1. Include calculations with registered engineer seal, verifying wall panel and attachment method resist wind pressures imposed on it pursuant to applicable building codes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Manufacturer.

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

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: Company specializing in Architectural Sheet Metal Products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Remove strippable protective covering on metal panels as panels are being installed. Do not leave the film on installed panels.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Galvalume Substrate Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing or perforating.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: 20 years and 6 months from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel 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, chipping, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.01 cfm/sq. ft. (0.05 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 4.00 lbf/sq. ft (191.5 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

2.2 CONCEALED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

1. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), 3105 alloy as standard with manufacturer, with H14 temper as required to suit forming operations and structural performance required.
   a. Thickness: 0.032 inch (0.81 mm)
   b. Surface: Smooth, flat finish.
   c. Exterior Finish: Two-coat fluoropolymer
   d. Color: Dark bronze AAMA 2605

2. Panel Coverage: 12 inches (305 mm)
3. Panel Height: 1.5 inches (38 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils (1.02 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Grace Ultra
   b. Mid-States Asphalt Quick Stick HT Pro
   c. Polyglass Polystick MTS
   d. Soprema Lastobond Shield HT
   e. Tamko TW Underlayment or TW Metal & Tile Underlayment
2. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
3. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES

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

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

if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat applied by panel manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75± 0.05 mil (0.019± 0.0013 mm) over 0.2± 0.05 mil (0.05± 0.0013 mm) primer coat, to provide a total dry film thickness of 0.95± 0.10 mil (0.024± 0.0025 mm). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.

2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use stainless-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
5. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

A. Water-Spray Test: After installation, test area of assembly for water penetration according to AAMA 501.2.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

C. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

SECTION 074646

FIBER-CEMENT PANEL SIDING

Part I - General

1.1 SECTION INCLUDES:

A. Exterior, panelized fiber cement cladding system and accessories to complete a drained and back-ventilated rainscreen.
B. Interior fiber cement panelized cladding system and accessories.

1.2 RELATED SECTIONS

A. Section 05 41 00 - Structural Metal Stud Framing
B. Section 06 10 00 - Rough Carpentry
C. Section 06 16 00 - Sheathing
D. Section 07 20 00 - Thermal Protection
E. Section 07 25 00 - Weather Barriers
F. Section 07 60 00 - Flashing and Sheet Metal
G. Section 07 90 00 - Joint Protection

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 509-14 – Voluntary Test and Classification Method of Drained and Back Ventilated Rain Screen Wall Cladding Systems
B. ASTM International (ASTM):
   1. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   2. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber Cement.
   3. ASTM E-84 - Standard Test for Surface Burning Characteristics of Building Materials.
   4. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   5. ASTM E 228 - Standard Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer.
   6. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   7. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   8. ASTM C 1186 – Standard Specification for Flat Fiber-Cement Sheets.
C. Florida Building Code - Test Protocol HVHZ
   1. Testing Application Standard (TAS) 202, 203 – HVHZ Test Procedures
D. National Fire Protection Association (NFPA):
   1. NFPA 285 - Fire Test Method for Exterior Wall Assemblies Containing Combustible Material.
   2. NFPA 268 – Ignition Resistance of Exterior Wall Assemblies.
E. Standards Council of Canada & Underwriters Laboratories Canada (ULC):
   1. CAN/ULC S-102 – Standard Method of Test for Surface Burning Characteristics.
   2. CAN/ULC S-134 – Standard Method of Fire Test of Exterior Wall Assembly.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data: Submit manufacturer’s product description, storage and handling requirements, and installation instructions.

C. Product Test Reports and Code Compliance: Documents demonstrating product compliance with local building code, such as test reports or Evaluation Reports from qualified, independent testing agencies.
D. LEED Credits: Provide documentation of LEED Credits for project certification under USGBC LEED 2009 (Version 3.0) or 2012 v.4.
E. Manufacturer's Details: Submit drawings (.dwg, .rvt, and/or .pdf formats), including plans, sections, showing installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.
F. Samples: Submit samples of each product type proposed for use.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. All fiber cement panels specified in this section must be supplied by a manufacturer with a minimum of 10 years of experience in fabricating and supplying fiber cement cladding systems.
      a. Products covered under this section are to be manufactured in an ISO 9001 certified facility.
   2. Provide technical and design support as needed regarding installation requirements and warranty compliance provisions.
B. Installer Qualifications: All products listed in this section are to be installed by a single installer trained by manufacturer or representative.
C. Mock-Up Wall: Provide a mock-up wall as evaluation tool for product and installation workmanship.
D. Pre-Installation Meetings: Prior to beginning installation, conduct conference to verify and discuss substrate conditions, manufacturer's installation instructions and warranty requirements, and project requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation. Do not stack pallets more than two high. Refer to the information included on each pallet.
B. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty.
C. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage.
D. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.

1.7 WARRANTY

A. Provide manufacturer's 15-year warranty against manufactured defects in fiber cement panels. Additional 5-year extension available when refinished in year 14-15.
B. Provide manufacturer's 15-year warranty against manufactured defects in panel finish.
C. Warranty provides for the original purchaser. See warranty for detailed information on terms, conditions and limitations.

PART II: PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Nichiha Corporation, 18-19 Nishiki 2-chome Naka-ku, Nagoya, Aichi 460-8610, Japan.
B. Acceptable Manufacturer's Representative: Nichiha USA, Inc., 6465 E. Johns Crossing, Suite 250, Johns Creek, GA 30097. Toll free: 1.866.424.4421, Office: 770.805.9466, Fax: 770.805.9467, www.nichiha.com.

1. Basis of Design Product: Nichiha VintageWood.
    a. Profile color: Bark
    b. Profiles: Wood plank texture with three, 3/8” grooves running lengthwise, spaced 5-5/8” apart.
    c. Accessory/Component Options:
        i. Manufactured Corners with 3-1/2” returns
        ii. Aluminum trim options: Corner Key, Open Outside Corner, H-Mold, J-Mold, Compression Joint, Inside Corner
            1. Finish: Bark
        iii. Essential Flashing System: Starter, Overhang.
            1. Finish: Matte black.
    d. Dimensions:
        1. AWP-1818: 455mm (17-7/8”) (h) x 1,818 mm (71-9/16”) (l).
        2. AWP-3030: 455mm (17-7/8”) (h) x 3,030 mm (119-5/16”) (l).
    e. Panel Thickness: 16 mm (5/8").
    f. Weight: AWP-1818: 35.27 lbs. per panel, AWP-3030: 57.32 lbs. per panel.
    g. Coverage: 8.88 sq. ft. per panel (1818), 14.81 sq. ft. per panel (3030).
    h. Factory sealed on six [6] sides.

C. Substitutions: As approved by Marriott

D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 MATERIALS

A. Fiber cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles.

B. Panel surface pre-finished and machine applied.

C. Panels profiled along 3030mm edges so that the long joints between the installed panels are ship-lapped.

D. Factory-applied sealant gasket added to top panel edge; all 3030mm edge joints contain a factory sealant.

2.3 PERFORMANCE REQUIREMENTS:

A. Fiber Cement Cladding – Must comply with ASTM C-1186, Type A, Grade II requirements:
    1. Wet Flexural Strength: Result: 1418 psi, Lower Limit: 1015 psi.
    2. Water Tightness: No water droplets observed on any specimen.
    3. Freeze-thaw: No damage or defects observed.
    4. Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.
    5. Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.

B. Mean Coefficient of Linear Thermal Expansion (ASTM E-228): Max 1.0*10^-5 in./in. F.

C. Surface Burning (CAN-ULC S102/ASTM E-84): Flame Spread: 0, Smoke Developed: 0.

D. Wind Load (ASTM E-330): Contact manufacturer for ultimate test pressure data corresponding to framing type, dimensions, fastener type, and attachment clips. Project engineer(s) must determine Zone 4 and 5 design pressures based on project specifics.
    1. Minimum lateral deflection: L/120.

E. Water Penetration (ASTM E-331): No water leakage observed into wall cavity.

F. Steady-State Heat Flux and Thermal Transmission Properties Test (ASTM C-518): 16mm thick panel thermal resistance R Value of 0.47.

G. Fire Resistant (ASTM E-119): The wall assembly must successfully endure 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.

H. Ignition Resistance (NFPA 268): No sustained flaming of panels, assembly when subjected to a minimum radiant heat flux of 12.5 kW/m2 ± 5% in the presence of a pilot ignition source for a 20-minute period.

I. Fire Propagation (NFPA 285): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Commercial Wrap, ½” Densglass Gold Sheathing, 16” o.c. 18 gauge steel studs, mineral

wool in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of NFPA 285.

J. Fire Propagation (CAN/ULC S-134): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Housewrap, 5/8" FRT plywood, 16" o.c. 2x wood studs, fiberglass in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of CAN/ULC S-134.

K. Drained and Back Ventilated Rainscreen (AAMA 509-14): System classifications: W1, V1.

L. Florida Building Code - Test Protocol HVHZ (TAS 202, 203): Horizontal Application Design Pressure: 95 psf, Vertical Application Design Pressure: 85 psf.

2.4 INSTALLATION COMPONENTS

A. Ultimate Clip System:
   1. Starter Track:
      a. Horizontal Panel Installations - FA 700 – 3,030mm (l) galvalume coated steel.
      b. Vertical Panel Installations (AWP-3030 only) – FA 710T – 3,030mm (l) galvalume coated steel.
   2. Panel Clips: JEL 778 "Ultimate Clip II" (10mm rainscreen for 16mm AWP) – Zinc-Aluminum-Magnesium alloy coated steel.
      a. Joint Tab Attachments (included) – used at all AWP-1818 panel to panel vertical joints, NOT used with AWP-3030 installations.
   3. Corner Clips: JE 777C (10mm rainscreen for 5/8" AWP Manufactured Corners) -- Zinc-Aluminum-Magnesium alloy coated steel.
   4. Single Flange Sealant Backer – FHK 1015 R (10mm) – 6.5' (l) fluorine coated galvalume.
   5. Double Flange Sealant Backer – FH 1015 R (10mm) – 10' (l) fluorine coated galvalume.
   6. Corrugated Spacer – FS 1005 (5mm), FS 1010 (10mm) – 4' (l).

B. Aluminum Trim (optional): Paint primed trim as specified in finish schedule.

C. Essential Flashing System (optional):
   1. Starter – main segments (3,030mm), inside corners, outside corners
   2. Overhang – main segments (3,030mm), inside corners, outside corners, joint clips

D. Fasteners: Corrosion resistant fasteners, such as hot-dipped galvanized screws appropriate to local building codes and practices must be used. Use Stainless Steel fasteners in high humidity and high-moisture regions. Panel manufacturer is not liable for corrosion resistance of fasteners. Do not use aluminum fasteners, staples or fasteners that are not rated or designed for intended use. See manufacturer's instructions for appropriate fasteners for construction method used.

E. Flashing: Flash all areas specified in manufacturer's instructions. Do not use raw aluminum flashing. Flashing must be galvanized, anodized, or PVC coated.

F. Sealant: Sealant shall comply with ASTM C920, Class 35.

PART III: EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Fiber cement panels can be installed over braced wood, steel studs and sheathing including plywood, OSB, plastic foam (1" or less) or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's) and Concrete Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction. Insulated Concrete Forms (ICFs) require added measures. Consult with Nichiha Technical Services.
   2. Allowable stud spacing: 16" o.c. maximum.
   3. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier (WRB) as defined by the 2015 IBC or IRC. Refer to local building codes.
   4. Appropriate metal flashing should be used to prevent moisture penetration around all doors, windows, wall bottoms, material transitions and penetrations. Refer to local building codes for best practices.

B. Examine site to ensure substrate conditions are within alignment tolerances for proper installation.

C. Do not begin installation until unacceptable conditions have been corrected.
D. Do not install panels or components that appear to be damaged or defective. Do not install wet panels.

3.2 TOLERANCE

A. Wall surface plane must be plumb and level within +/- ¼ inch in 20 feet in any direction.
   1. One layer of Nichiha 5mm (~3/16") Spacer may be used as shim.

3.3 INSTALLATION

A. General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation.
   1. Consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building higher than 45 feet or three stories or for conditions not matching prescribed standard installation guide requirements and methods. A Technical Design Review (TDR) process is available to evaluate project feasibility.
   2. Vertical Control/Expansion Joints are required with AWP-1818, for walls wider than 30 feet, within 2-12 feet of outside corners finished with metal trim and approximately every 30 feet thereafter.
      a. Vertical Control/Expansion Joints are required at each AWP-3030 vertical joint, or H-Mold trim may be used instead.
   3. Horizontal/Compression Joints are required for multi-story installations of AWP. Locate joints at floor lines. Joints are flashed minimum ½" breaks. Do not caulk. Refer to installation guide(s).
      A. Wood framed buildings of three or more floors require a compression joint at each floor.
      B. Steel framed buildings (including reinforced concrete core with LGMF exterior walls) of more than three floors (or 45 feet) require a compression joint every 25 feet at a floor line.

B. Panel Cutting
   1. Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area.
   2. Always wear safety glasses and NIOSH/OSHA approved respirator whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer SDS for more information.
   3. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade.
      a. Recommended circular saw: Makita 7-1/4" Circular Saw with Dust Collector (#5057KB).
      b. Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505).
      c. Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork.
   4. Silica Dust Warning: Fiber cement products may contain some amounts of crystalline silica, a naturally occurring, potentially hazardous mineral when airborne in dust form. Consult product SDS or visit https://www.osha.gov/dsg/topics/silicacrystalline/.
   5. Immediately clean dust from cut panels as it may bind to the finish.

3.4 CLEANING AND MAINTENANCE

A. Review manufacturer guidelines for detailed care instructions.

SECTION 075323

SINGLE-PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies adhered EPDM membrane roofing system, including roof insulation.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

C. Maintenance data.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Source Limitations: Obtain components for membrane roofing system from same manufacturer as roofing membrane.

C. Exterior Fire-Test Exposure: ASTM E 108, Class B; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. Thermal resistance ("R-value"): overall average R-value of roof insulation system is called out on the drawings and is based on average industry R-values for specified insulation products. Supplier/installer of insulation shall provide calculations verifying that the average R-value of the complete tapered system equals or exceeds that called out on the drawings. If it does not, the thickness of the system shall be increased as necessary to achieve that average value at no expense to the Owner and without altering the slopes indicated on the roof plans.

1.4 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which

manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.

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

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM, and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Carlisle SynTec Incorporated.
   b. Firestone Building Products Company.
   c. GenFlex Roofing Systems.
   d. Johns Manville International, Inc.
2. Thickness: 60 mils (1.5 mm), nominal.
3. Exposed Face Color: Black.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, partially cured or cured, according to application.

C. Protection Sheet: Epichlorohydrin or neoprene non-reinforced flexible sheet, 55- to 60-mil- (1.4- to 1.5-mm-) thick, recommended by EPDM manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.

D. Bonding Adhesive: Manufacturer's standard.

E. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch- (75-mm-) wide minimum, butyl splice tape with release film.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

G. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.3 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) , unless otherwise indicated.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

D. Portions of the roof insulation may be supplied as EPS (expanded polystyrene) at the contractor's option. Refer to the drawings for extent of allowable substitution.

2.4 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

B. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.5 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 1.6 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof in accordance with manufacturer’s spacing recommendations.
2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F (14 deg C) of equiviscous temperature.

3.2 ADHERED ROOFING MEMBRANE INSTALLATION

A. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply bonding adhesive to splice area of roofing membrane.

D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.

E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

G. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.3 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.4 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

END OF SECTION 075323

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Manufactured reglets with counterflashing
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed steep-slope roof sheet metal fabrications.
5. Formed wall sheet metal fabrications.
6. Formed equipment support flashing.

B. Related Requirements:
1. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following:
1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of

expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of coping and roof edge flashing

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Evaluation Reports: For copings

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.
1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: 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 Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: [20] years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with [NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing"] [and] [SMACNA's "Architectural Sheet Metal Manual"] requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. FM Approvals Listing: Manufacture and install [copings] [roof edge flashings] that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-120.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat-gain and nighttime-sky heat loss.
   1. Temperature Change: [120 deg F (67 deg C), ambient; material surfaces]

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with [smooth, flat] surface.
   1. As-Milled Finish: [Mill]
   2. Alclad Finish: Metallurgically bonded surfacing alloy on both sides, forming aluminum sheet with reflective luster.
   3. Factory Prime Coating: Where painting after installation is required, pretreat metal with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of 0.2 mil (0.005 mm).
   4. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
   5. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
      a. Color: [Dark bronze]
      b. Color Range: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
   6. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions[for seacoast and severe environments].
   7. Color: [As selected by Architect from manufacturer's full range]
   8. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Atlas EPS; a Division of Atlas Roofing Corporation.
      b. Intertape Polymer Group.
      c. Kirsch Building Products, LLC.
      d. SDP Advanced Polymer Products Inc.
   2. Source Limitations: Obtain underlayment from single source from single manufacturer.

C. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
      b. GCP Applied Technologies Inc.
      c. Henry Company.
      d. Metal-Fab Manufacturing, a Drexel Metals Company.
      e. Owens Corning.
      f. Protecto Wrap Company.
      g. SDP Advanced Polymer Products Inc.
   2. Source Limitations: Obtain underlayment from single source from single manufacturer.
   3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (29 deg C) or lower.

D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
      c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C920, elastomeric [polyurethane] [polysulfide] [silicone] polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

H. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

I. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Counter-Flash Reglet CFR-375 or comparable product by one of the following:
      a. Cheney Flashing Company.
      b. Fry Reglet Corporation.
      c. Heckmann Building Products, Inc.
      d. Hohmann & Barnard, Inc.
      e. Keystone Flashing Company, Inc.
      f. National Sheet Metal Systems, Inc.
      g. OMG, Inc.
   2. Source Limitations: Obtain reglets from single source from single manufacturer.
   3. Material: Aluminum, 0.050 inch (1.27 mm) thick
   4. Face Height: 5-1/4 inches (133 mm)
   5. Surface-Mounted Type: Provide with slotted holes 12 inches (305 mm) o.c. and prenotched lap joints 3 inches (76 mm) for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
   6. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
   7. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
   8. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
   9. Accessories:
      a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
      b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
   10. Finish: [Mill]

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
   1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
   2. 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.
   3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.

4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:
1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard[and by FM Global Property Loss Prevention Data Sheet 1-49] for application, but not less than thickness of metal being secured.

G. Seams:
1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.[Rivet joints where necessary for strength.]
3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.[Rivet joints where necessary for strength.]

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Seal-Tite [Gold IGG-1] Gutters or comparable product.

B. Hanging Gutters:
1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
2. Fabricate in minimum 96-inch- (2400-mm-) long sections.
3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than [twice the gutter thickness
4. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.[Shop fabricate interior and exterior corners.]
5. Expansion Joints: [Lap type]
6. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
   a. Aluminum: [0.040 inch (1.02 mm)]
7. Gutters with Girth 16 to 20 Inches (410 to 510 mm): Fabricate from the following materials:
   a. Aluminum: [0.050 inch (1.27 mm)]
8. Gutters with Girth 21 to 25 Inches (530 to 640 mm): Fabricate from the following materials:
   a. Copper: [20 oz./sq. ft. (0.68 mm) thick] <Insert value>.

b. Aluminum: [0.063 inch (1.60 mm)]

9. Gutters with Girth 26 to 30 Inches (660 to 760 mm): Fabricate from the following materials:
   a. Copper: [24 oz./sq. ft. (0.82 mm) thick] <Insert value>.
   b. Aluminum: [0.040 inch (1.02 mm)] [0.050 inch (1.27 mm)] [0.063 inch (1.60 mm)] <Insert dimension> thick.
   c. Stainless Steel: [0.0313 inch (0.795 mm)] <Insert dimension> thick.
   d. Zinc-Tin Alloy-Coated Copper: [24 oz./sq. ft. (0.82 mm) thick] <Insert value>.
   e. Galvanized Steel: [0.026 inch (0.65 mm), 24 gauge] [0.040 inch (1.02 mm)] <Insert dimension> thick.
   f. Aluminum-Zinc Alloy-Coated Steel: [0.040 inch (1.02 mm)] <Insert dimension> thick.

C. Downspouts: Fabricate [rectangular] downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from [same material as downspouts and anchors]
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Seal-Tite [LT] Downspouts or comparable product.
   2. Fabricate from the following materials:
      a. Aluminum: [0.040 inch (1.02 mm)] Scupper configurations vary considerably. Parapet scuppers, installed in parapet wall, discharge into conductor heads or, as overflow scuppers, merely project through parapet. Scuppers combined with roof edge flashing (gravel stop) or fascia caps, discharging into hanging gutters or conductor heads, are specified in "Low-Slope Roof Sheet Metal Fabrications" Article.

D. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-(100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.[Fasten gravel guard angles to base of scupper.] Fabricate from the following materials:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Seal-Tite Scuppers or comparable product.
   2. Aluminum: [0.063 inch (1.60 mm)]

E. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes[, exterior flange trim,] [and] [built-in overflows]. Fabricate from the following materials:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Seal-Tite Collector Boxes or comparable product.
   2. Aluminum: [0.063 inch (1.60 mm)]

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing Gravel Stop and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-ft.- (3.6-m-) long, sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates and continuous cleats. Shop fabricate interior and exterior corners.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Anchor-Tite Fascia or comparable product.
   2. Joint Style: [Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate]
   3. Fabricate from the following materials:
      a. Aluminum: [0.040 inch (1.02 mm)] [0.050 inch (1.27 mm)] [0.063 inch (1.60 mm)] [0.080 inch (2 mm)] thick.

B. Copings: Fabricate in minimum 48-inch- (1200-mm-) long, but not exceeding 12-ft.- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Perma-Tite Coping or comparable product.
   2. Joint Style: [Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate
   3. Concealed Splice Plates: 8 inches (203 mm) wide, of material to match product with dual factory-applied butyl sealant strips at each joint.

4. Anchor Clips: 12-inch- (305-mm-) wide, galvanized steel sheet[, 36 inches (914 mm) o.c].
5. Fabricate from the following materials:
    a. Copper: [24 oz./sq. ft. (0.82 mm) thick]
    b. Aluminum: [0.050 inch (1.27 mm)]

C. Base Flashing: [Shop fabricate interior and exterior corners.]Fabricate from the following materials:
1. Aluminum: [0.040 inch (1.02 mm)] thick.

D. Counterflashing: [Shop fabricate interior and exterior corners.]Fabricate from the following materials:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Counter-Flash [CFW-375]
2. Face Height: [3-3/4 inches (95 mm)]
3. Aluminum: [0.040 inch (1.01 mm)]

E. Flashing Receivers: Fabricate from the following materials:
1. Aluminum: [0.040 inch (1.02 mm)]

F. Roof-Penetration Flashing: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft. (0.55 mm) thick]

G. Roof-Drain Flashing: Fabricate from the following materials:
1. Copper: [12 oz./sq. ft. (0.41 mm) thick]

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12-ft.- (3.6-m-) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Copper: [16 oz./sq. ft. (0.55 mm) thick]

B. Opening Flashings in Frame Construction: Fabricate head, sill,[jamb,] and similar flashings to extend [4 inches (100 mm)] beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Aluminum: [0.032 inch (0.81 mm)] thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:
1. Copper: [16 oz./sq. ft. (0.55 mm) thick] <Insert value>.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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

3.2 INSTALLATION OF UNDERLAYMENT

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.
   1. Install in shingle fashion to shed water.
   2. Lap joints not less than 2 inches (50 mm).

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
   1. Lap horizontal joints not less than 4 inches (100 mm).
   2. Lap end joints not less than 12 inches (300 mm).

C. Self-Adhering, High-Temperature Sheet Underlayment:
   1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
   2. Prime substrate if recommended by underlayment manufacturer.
   3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
   4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
   5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
   6. Roll laps and edges with roller.
   7. Cover underlayment within 14 days.

D. Install slip sheet, wrinkle free, before installing sheet metal flashing and trim.
   1. Install in shingle fashion to shed water.
   2. Lapp joints not less than 4 inches (100 mm).

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
   1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
   3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
   4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
   5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
   6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
   8. Do not field cut sheet metal flashing and trim by torch.
   9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of [10 ft. (3 m)] with no joints within 24 inches (600 mm) of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate [wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws] [substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance]

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
    a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
    b. Form joints to completely conceal sealant.
    c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
    d. Adjust setting proportionately for installation at higher ambient temperatures.
        1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 INSTALLATION OF ROOF-DRAINAGE SYSTEM

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:
1. Join sections with joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Fasten gutter spacers to front and back of gutter.
7. Anchor and loosely lock back edge of gutter to continuous cleat
8. Anchor back of gutter that extends onto roof deck with cleats spaced not more than [24 inches (600 mm)] apart.

C. Downspouts:
1. Join sections with 1-1/2-inch (38-mm) telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

D. Splash Pans:
1. Install where downspouts discharge on low-slope roofs
2. Set in elastomeric sealant compatible with the substrate.

E. Parapet Scuppers:
1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

3. Loosely lock front edge of scupper with conductor head.
4. Seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.

F. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch (25 mm) below [scupper] [or] [gutter] discharge.

G. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches (100 mm) in direction of water flow.

3.5 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements[, sheet metal manufacturer's written installation instructions,] and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at [staggered 3-inch (75-mm)] <Insert spacing> centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.
    a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at [24-inch (600-mm)] [16-inch (400-mm)] <Insert dimension> centers.
    b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at [24-inch (600-mm)] <Insert dimension> centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).
4. Secure in waterproof manner by means of anchor and washer spaced at 12 inches (300 mm) o.c. along perimeter and 6 inches (150 mm) o.c. at corners areas unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with [elastomeric] sealant and clamp flashing to pipes that penetrate roof.

3.6 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation

of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill,[jamb,] and similar flashings to extend [4 inches (100 mm)] beyond wall openings.

C. Reglets: Installation of reglets is specified in [Section 033000 "Cast-in-Place Concrete."] [Section 042000 "Unit Masonry."]

3.7 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:
   1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
   2. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.9 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.10 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in 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, as determined by Architect.

END OF SECTION 076200

SECTION 077200

ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Equipment supports.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: For roof accessories.

C. Samples: For each exposed product and for each color and texture specified.

D. Operation and maintenance data.

E. Warranty: Sample of special warranty.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

D. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

E. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

F. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

C. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

D. Sealants: As recommended by roof accessory manufacturer for installation indicated.

2.3 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

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

    a. Greenheck Fan Corporation.
    b. Roof Products, Inc.
    c. Thybar Corporation.

B. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch (1.32 mm) thick.

C. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
3. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
5. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.
6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.

2.4 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

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

    a. Greenheck Fan Corporation.
    b. Roof Products, Inc.
    c. Thybar Corporation.

B. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch (1.32 mm) thick.

C. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
3. Factory-installed continuous wood nailers 5-1/2 inches (140 mm) wide at tops of equipment supports.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
6. Fabricate equipment supports to minimum height of 12 inches (300 mm) unless otherwise indicated.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

C. Seal joints with sealant as required by roof accessory manufacturer.

3.2 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 078100

APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes SFRMs (sprayed fire-resistive materials) applied to surfaces that are concealed from view behind other construction when the Work is completed.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show extent of SFRM for each construction and fire-resistance rating, applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction, and minimum thicknesses.

C. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer approved by SFRM manufacturer to install manufacturer's products. A manufacturer's willingness to sell its SFRM to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. SFRM Testing: By a qualified testing and inspecting agency engaged by Contractor or manufacturer to test for compliance with specified requirements for performance and test methods.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply SFRM when ambient or substrate temperature is 40 deg F (4 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of SFRM. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

C. Sequence and coordinate application of SFRM with other related work specified in other Sections to comply with the following requirements:

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Contractor and by Installer, in which manufacturer agrees to repair or replace SFRMs that fail in materials or workmanship within one year of substantial completion.

PART 2 - PRODUCTS

2.1 SFRM

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Concealed Cementitious SFRM:
      a. Grace, W. R. & Co. - Conn., Construction Products Div.; Monokote Type MK-6.
   2. Exposed Cementitious SFRM:
      a. Grace, W. R. & Co. Z 106 (for interior use)
      b. Grace, W. R. & Co Z 146 (for exterior & high humidity areas)

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with SFRM and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of work.

B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

C. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application.

D. Apply SFRM in thicknesses and densities not less than those required to achieve fire-resistance ratings designated for each condition. Install system per SFRM manufacturer’s written instructions.

E. Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

F. Repair or replace work that has not successfully protected steel.

3.2 FIELD QUALITY CONTROL

A. Remove and replace applications of SFRM that do not pass tests and inspections for cohesion and adhesion, for density, or for both and retest as specified above.

B. Apply additional SFRM, per manufacturer's written instructions, where test results indicate that thickness does not comply with specified requirements, and retest as specified above.

END OF SECTION 078100

SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are 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.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:

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.

C. 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 penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. 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.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

1. 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. Joint system schedule.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

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 a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems bearing classification marking of qualified testing and inspecting agency.

D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

E. 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

2.1 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. Grace, W. R. & Co. - Conn.
2. 3M; Fire Protection Products Division.
3. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING

A. 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.

B. 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.

PART 3 - EXECUTION

3.1 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.

D. Identification: Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) 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. 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.

3.2 FIELD QUALITY CONTROL

A. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. The supplier is to submit a joint system schedule as part of the shop drawing submittal process. Provide products from a single manufacturer.

END OF SECTION 078413

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples: For each kind and color of joint sealant required.

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

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

D. Product test reports.

E. Preconstruction field-adhesion test reports.

F. Warranties.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

B. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

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

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

A. Mildew-Resistant Silicone Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Dow Corning Corporation.
   b. GE Advanced Materials - Silicones.
   c. Pecora Corporation.
   d. Tremco Incorporated.
   e. Sonneborn, Division of ChemRex Inc.
2. Type: Single component (S).

3. Grade: Nonsag (NS).
4. Class: 25.
5. Uses Related to Exposure: Traffic (T) and Nontraffic (NT).

2.3 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant: ASTM C 920.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sika Corporation; Construction Products Division.
   b. Tremco Incorporated.
   c. Sonneborn, Divisino of ChemRex, Inc.
2. Type: Single component (S).
3. Grade: Nonsag (NS).
4. Class: 25.
5. Uses Related to Exposure: Traffic (T) and Nontraffic (NT).

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Pecora Corporation.
   b. Tremco Incorporated.
   c. Sonneborn, Division of Chamrex Inc.

2.5 ACOUSTICAL JOINT SEALANTS

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

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Pecora Corporation.
   b. USG Corporation.

2.6 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that 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.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: Comply with ASTM C 919 and with manufacturer's written recommendations.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: As noted in Joint-Sealant Schedule provided by installer as part of submittals.

END OF SECTION 079200

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior Hollow Metal Doors and Frames
2. Exterior Hollow Metal Doors and Frames

B. Related Sections:

1. Section 07 92 00 – Joint Sealants
2. Section 08 14 00 - Wood Doors
3. Section 08 71 00 - Door Hardware
4. Section 08 80 00 - Glazing
5. Section 09 90 00 - Painting

1.02 REFERENCES

A. ASTM International (ASTM) Publications:

1. A153 "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
2. A568 "Standard Specification for Steel Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for"
3. A653 "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process"
4. A879/879M Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
5. A924 "Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process"
6. A1008 "Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
7. A1011 "Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability"
8. C143 “Standard Test Method for Slump of Hydraulic Cement Concrete”
9. C476 “Standard Specification for Grout for Masonry”
10. E90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements"
11. E413 “Classification for Rating Sound Insulation”
12. E2074 "Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies"

Commented [DW1]: *Withdrawn. Replaced by ASTM A879*

B. American National Standards Institute (ANSI) Publications:

1. ANSI/SDI A250.3 "Test Procedure and Acceptance Criteria for Factory Applied Finish Painted Steel Surfaces for Steel Doors and Frames"
2. ANSI/SDI A250.4 "Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frame Anchors and Hardware Reinforcings"
3. ANSI/SDI A250.6 "Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames"
4. ANSI/SDI A250.8 - SDI-100 "Recommended Specifications for Standard Steel Doors and Frames"
5. ANSI/SDI A250.10 "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames"
6. ANSI/SDI A250.11 "Recommended Erection Instructions for Steel Frames (Formerly SDI-105)"

C. ANSI/DHI Publications:

1. DHI A115.1G "Installation Guide for Doors and Hardware"

D. Commercial Standards

1. CS-242-62

E. National Association of Architectural Metal Manufacturers (NAAMM) Publications:

1. "Metal Finishes Manual for Architectural and Metal Products"

F. National Fire Protection Association (NFPA) Publications:

1. NFPA 80 "Standard for Fire Doors and Windows"
2. NFPA 105 "Hot Smoke Test"
3. NFPA 252 “Standard Methods of Fire Tests of Door Assemblies”

Commented [DW2]: *Duplicated above*

G. Steel Door Institute (SDI) Publications:

1. SDI Publications as referenced throughout this Section.

H. Underwriter's Laboratories, Inc. (UL) Standards

1. UL Building Materials Directory; Underwriters Laboratories Inc.
2. UL 10B "Standard for Fire Tests of Door Assemblies"
3. UL 10C "Positive Pressure Fire Tests of Door Assemblies"
4. UL 1784 "Air Leakage Tests of Door Assemblies"
5. Procedure No. R-3791
6. Procedure No. R-3821

I. Warnock Hersey, ETL SEMKO division of Intertek (WHI) Publications:

1. "Certification Listings"

1.03 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, and finishes for each type of steel door and frame specified.

2. Submit Shop Drawings and product data indicating pertinent dimensioning, construction, component connections and locations, anchorage methods and locations, hardware locations and installation details, and the following:

a. Elevations of each door design.

b. Details of doors including vertical and horizontal edge details.

c. Frame details for each frame type including dimensioned profiles.

d. Details and locations of reinforcement and preparations for hardware.

e. Details of each different wall opening condition.

f. Details of anchorages, accessories, joints, and connections.

g. Coordination of glazing frames and stops with glass and glazing requirements.

3. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.

a. Indicate coordination of glazing frames and stops with glass and glazing requirements.

4. General Contractor's Inspection Report: Refer to Inspection article in Part 3 – EXECUTION.

1.05 QUALITY ASSURANCE

A. Hollow metal doors and frames shall be fabricated in accordance with standards and specifications established by Steel Door Institute, complying with ANSI A250.8-1998 (SDI-100) "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

B. Acoustical qualities: Doors shall have a minimum sound transmission classification (STC) of 29 per ASTM E413. when tested in a fixed position according to ASTM E90..

C. Fire-Rated Door Assemblies: Units that comply with NFPA 80 are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E2074, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated. Test pressure shall be tested in accordance with NFPA 252, or UL 10C to comply with local code requirements.

D. Opening assemblies shall meet the requirements of NFPA 105 Hot Smoke Test.

E. All stairwell doors and other doors as may be shown on the Drawings shall comply with the temperature-rise rating of 450 degrees F. maximum in 30 minutes of fire exposure.

F. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

1. Assembly and installation shall be performed by qualified personnel who have successfully completed manufacturer's prefinished steel door frame installation course and have been approved by the manufacturer.
2. Certificate: When requested, submit certificate indicating qualification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work cardboard wrapped or crated to provide protection during transit and job storage.
   1. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
   2. Deliver welded frames with two removable spreader bars across bottom of frames.

B. Label each item, before shipping, with metal or plastic tags to show their location, size, door swing, and other pertinent information.

C. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to [[Owner's Representative]. Remove and replace damaged items that cannot be repaired as directed.

D. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

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

1.08 COORDINATION

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

PART 2 PRODUCTS

2.01 DISTRIBUTOR

A. Avendra, LLC Preferred Manufacturers:
   1. Contract Hardware, Inc. (404-350-9408)
      a. Contact: Mark Tew

2.02 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Steelcraft, an Allegion Brand (888-758-9823)
2. Ceco Door, an ASSA ABLOY Group Company (615-661-5030)
3. Republic Doors and Frames (800-733-3667)
4. CURRIES, an ASSA ABLOY Group Company (800-377-3948)

2.03 MATERIALS

A. Hot-Rolled Steel Sheets: ASTM A1011 and A568, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel SheetsASTM A1008 and A568, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A879/A879M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

D. Hot dipped zinc coated steel shall be of the alloyed type and comply with ASTM A924 and A653.

E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A153, Class B.

F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to to ASTM A153.

G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143.

H. 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.

I. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC Paint 20.

J. Hardware reinforcing on doors and frames shall comply with ANSI/SDI A250.6. The physical performance levels shall be in accordance with ANSI/SDI A250.4.

2.04 HOLLOW METAL FRAMES

A. General:

1. Fabricate steel frame units to comply with ANSI/SDI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Conceal fastenings, unless otherwise indicated.

B. Location and Type: All metal frames for doors shall be formed of steel to sizes and shapes indicated.

1. All exterior door frames, public space frames, and back-of-house frames shall be fabricated with continuously welded corners unit type construction at joints, unless noted otherwise.
2. All interior guestroom door frames shall be prefinished frames (Timely or Rediframe)

3. Frames shall be furnished with Underwriter's Laboratories label, as required, at the place of manufacturer.

C. Type and Gauges of Metal: Metal for frames shall be cold-rolled or hot-rolled, pickled and oiled, steel sheets with clean, smooth surfaces. Except where other gauges are indicated or specified, frames shall be fabricated from steel, not lighter than the standard Manufacturers Standard Gauge (MSG) as referenced in ANSI A250.8 :

1. Interior Frames of 16-gauge (0.053-inch) thick steel sheet for:
   a. Door openings wider than 48 inches.
   b. Level 2 steel doors.
   c. Wood doors, unless otherwise indicated.
2. Exterior Frames of 16-gauge (0.053-inch) thick steel sheet for:
   a. Door openings wider than 48 inches.
   b. Level 2 steel doors.
   c. Level 3 steel doors.
3. Exterior frames shall be 0.30 per square foot per side, hot-dipped galvanized or electrolytic zinc-coated steel with a stretcher level degree of flatness.

D. Workmanship and Design: The finished work shall be strong and rigid, neat in appearance, and free from defects. Fabricate members straight and true with corner joints well-formed, in true alignment and fastenings concealed where practicable.

E. Drywall Frames (Interior Guestroom Door Frames only):

1. Drywall frames shall be the same as flush frames except:
2. Frames shall be formed with double return backbends to prevent cutting into drywall surface. Frames shall be knocked down, designed to be securely installed in the rough opening after wallboard is applied. Mitered corners shall be reinforced with a wedge lock corner clip to provide a firm interlock of jambs to head.
3. Each jamb shall have an adjustable anchor located 4" from the top of the door opening to hold frame in rigid alignment. Frames shall have a welded-in base anchor attaching plate in each jamb for field installation of loose base anchors or frames shall have two (2) dimpled holes in each jamb for anchoring base of frame with screws.

F. Forming Corner Joints: Joints for welded-type frames shall be mitered and continuously arc-welded for full depth and width of frame and trim. All contact edges shall be closed tight and all welds on exposed surfaces dressed smooth and flush.

G. Provision for Hardware: Frames shall be prepared at the factory for the installation of hardware. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware, unless more stringent requirements are indicated. Welding of hinges to frames will not be permitted. Frames shall be mortised, reinforced, drilled, and tapped to templates to receive all mortised hardware. Provide cover boxes in back of all hardware cut-outs. Lock strikes shall be set out and adjusted to provide clearance for silencers.

1. Provide preparation for rubber silencers on interior room door frames; three per strike jamb at single doors.
2. Provide concealed metal reinforcements for hardware as required. The gauges of metal for reinforcement shall be in accordance with the manufacturer's recommendations for the type of hardware and the thickness and width of doors to be hung in the frame, provided that the gauges used are not lighter than those required by Commercial Standard CS-242-62.

a. Galvanized for exterior doors.

3. All frames shall have a security anchor system installed on strike jamb consisting of a compression anchor at 3-1/2" from head of door frame and a "Z" type security anchor at 45" above floor.

H. Wall Anchors: Provide metal anchors of shapes and sizes required for the adjoining type of wall construction. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24 inches apart. Galvanized anchors for exterior frames.

1. Anchor types shall be varied to provide positive fastening to adjacent construction.

2. Provide UL approved anchors for UL labeled frames. Anchorage of UL label frames shall conform to printed UL test report for door frame manufactured.

I. Plaster Guards: Provide 0.016-inch-thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation. Required at all door strikes.

J. Floor Anchors: Provide floor clips of not less than 16-gauge steel and fasten to bottom of each jamb member for anchoring frame to floor construction. Clips shall be adjustable and drilled for 3/8" diameter anchor bolts.

K. Shipment: For welded type frames, provide temporary steel spreaders fastened across bottom of frames. Where construction will permit concealment, leave spreaders in place after installation. Otherwise, remove spreaders after frames are set and anchored. In place of spreaders, frames may be strapped together in pairs with heads inverted for bracing during shipment. Before shipping, label each frame with metal or plastic tapes to show their location, size, door swing, and other pertinent information.

2.05 PREFINISHED FRAMES (PF)

A. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. "C-Series Frames"; Timely Industries, Inc. (800-247-6242)

b. Rediframe Products Division, Dunbarton Corporation, Inc. (800-633-7553)

B. Materials:

1. Frame: Provide minimum 18 gauge, cold-rolled steel sheet conforming to ASTM A366.

2. Fasteners: Types and sizes specified in manufacturer's installation instructions for project conditions.

3. Workmanship and Design: The finished work shall be strong and rigid, neat in appearance, and free from defects. Fabricate members straight and true with corner joints well-formed, in true alignment and fastenings concealed where practicable.

4. Provision for Hardware: Frames shall be prepared at the factory for the installation of hardware. Welding of hinges to frames will not be permitted. Frames shall be mortised, reinforced, drilled, and tapped to templates to receive all mortised hardware. Provide cover boxes in back of all hardware cut-outs. Lock strikes shall be set out and adjusted to provide clearance for silencers.

a. Provide preparation for rubber silencers on interior room door frames; three per strike jamb at single doors.

b. Provide concealed metal reinforcements for hardware as required. The gauges of metal for reinforcement shall be in accordance with the manufacturer's recommendations for the type of hardware and the thickness and width of doors to be hung in the frame, provided that the gauges used are not lighter than those required by Commercial Standard CS-242-62.

c. All frames shall have a security anchor system installed on strike jamb

1) Provide safeguard at strike to prevent entry by prying.

5. Wall Anchors: Provide metal anchors of shapes and sizes required for the adjoining type of wall construction. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24 inches apart. Anchor the frame to the wall with fasteners every 11-inches around the perimeter of the frame.

a. Anchor types shall be varied to provide positive fastening to adjacent construction.

6. Provide UL approved anchors for UL labeled frames. Anchorage of UL label frames shall conform to printed UL test report for door frame manufactured.

7. Finishes:

a. Factory-Applied Paint Finish: Manufacturer's standard, factory-applied baked enamel paint finish complying with ANSI A250.3 for performance and acceptance criteria.

1) Color: [Standard] color to match color as shown on Interior Finish Index.

2.06 FRAME INSULATION

A. Glass fiber, semi-rigid board, 2" thickness, unfaced, 3 lb. density.

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. "Type 703" - Owens-Corning Fiberglass Corp (800-438-7465)

b. Substitutions: None accepted

2.07 HOLLOW METAL DOORS

A. General:

1. Fabricate steel door units to comply with ANSI/SDI A250.8. and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.

2. For door types with embossed face designs, comply with the design designations in SDI 108 "Recommended Selection and Usage Guide for Standard Steel Doors."

B. Hollow Metal Doors:

1. Interior Doors: Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8.for level and model and ANSI/SDI A250.4 for physical-endurance level.

2. Interior Flush Door:

a. Model: "L Series"; Steelcraft, an Allegion Brand, or approved substitution by other listed manufacturers.

b. Level 2, Heavy Duty, 18-gage, and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

c. Thickness: 1-3/4"

d. Cores: Per ANSI/SDI A250.8

1) Doors shall be reinforced, stiffened, sound deadened and insulated with impregnated Kraft honeycomb core completely filling the inside of the doors and laminated to inside faces of both panels using contact adhesive applied to both panels and honeycomb core.

e. Minimum hardware reinforcing gages shall comply with Table 4 of ANSI/SDI A250.8.

3. Interior Temperature Rise Doors

a. Temperature rise doors shall be the same as flush door construction except core material shall be designed to produce the 450 degree temperature rise rating.

b. Cores: Per ANSI/SDI A250.8:

c. Mineral-Fiber Board: For labeled doors if a temperature-rise limit is required.

4. Exterior Doors: Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical-endurance level:

a. Flush Door:

1) Thickness: 1-3/4"

2) Model: "L Series"; Steelcraft, an Allegion Brand, or approved substitution by other listed manufacturers.

3) Level 3, Extra Heavy Duty, 16-gage, and Physical Performance Level B (Extra Heavy Duty), Model 2 (Seamless).

b. Exterior doors shall be fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C236 or ASTM C976 on fully operable door assemblies. Provide thermal-rated assemblies with U-factor of 0.24 or better. Hot-dipped galvanized or electrolytic zinc-coated steel with a stretcher level degree of flatness.

c. All exterior swing-out doors shall have the top and bottoms closed to eliminate moisture penetration. Door tops shall not have holes or openings.

C. Door Louvers:

1. Furnish and install louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch thick, cold-rolled steel sheet set into 0.032-inch thick steel frame.

a. Provide stationary sight-proof louvers with inverted V-Shaped or Y-Shaped blades of sizes and locations as shown on the Drawings.

b. Provide Fire-Rated Automatic Louvers of sizes and locations as shown on the Drawings at fire-rated openings. Louvers to be constructed with movable blades closed by actuating fusible links and listed and labeled for use in fire-rated door

assemblies of type and fire-resistance rating indicated by the same testing and inspecting agency that established fire-resistance rating of door assembly.

D. Door Fabrication:

1. Fabricate doors and frames in accordance with ANSI/SDI A250.8.

2. Workmanship: The finished work shall be rigid, neat in appearance, and free from defects; form molding members straight and true with joints coped or mitered, well formed and in true alignment. All welded joints on exposed surfaces shall be dressed smooth so they are invisible after finishing.

3. Door Sizes and Clearances: Doors shall be of type, sizes, and design indicated. The clearances for doors shall be 1/8" at jambs and heads and 3/4" at bottom, unless indicated or specified otherwise. Clearances at meeting edges of pairs of doors shall be 1/4" (1/8" on fire doors).

   a. Clearances for Fire-Rated Doors: As required by ANSI/NFPA 80.

4. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

5. Provisions for Hardware: Mortise, reinforce, drill, and tap doors at factory to receive all mortise-type hardware. Provide reinforcing only for doors to receive surface-applied hardware, except push plates and kick plates; drilling and tapping for surface-applied hardware will be done in the field. Provide metal reinforcing plates for surface-applied hardware as required. The gauges of metal for reinforcing plates shall comply with manufacturer's recommendation for the type of hardware used and the size and thickness of doors, provided that the minimum requirements are as follows:

   a. Hinge Reinforcement - 3/16 Inch

   b. Strike Reinforcement - 11 Gauge

   c. Closers and Bracket Reinforcement - 12 Gauge

   d. Mortise Covers - 26 Gauge

   e. The gauges used shall not be lighter than those required by Commercial Standard CS 242-62.

6. Glazing Preparation:

   a. Doors indicated to have glass shall have non-removable glazing stops on the exterior sides of the openings and removable or snap-on type stops on the inside of the openings.

   b. Provide manufacturer's vision lites of sizes and locations as shown on Drawings, recessed into the door face similar to "Dezigner Trim" by Steelcraft, or approved substitution by listed manufacturers.

   c. Stops shall be UL approved for UL labeled doors.

E. Doors with labels shall carry Underwriters label on the door and on the frame. They shall be constructed to meet Procedure No. R-3791 and R-3821, as listed by Underwriters Laboratories.

2.08 FINISHES

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

1. Finish steel doors and frames after assembly.

B. Factory Prime Coating for Field Painted Finish: Unless specified otherwise, provide manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI/SDI A250.10 for acceptance criteria.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.

3.02 GENERAL

A. Fabricate and install hollow metal units and their accessories in strict accordance with these Specifications and manufacturer's data.

B. Hardware: For installation see Division 08, "Door Hardware" Section of these Specifications.

3.03 PLACING FRAMES

A. Comply with the provisions of the "Steel Door Institute" 105, unless otherwise indicated.

B. Set frames accurately in position, plumbed, aligned, and braced until permanent anchors are set. Except for frames located in existing walls or partitions, place frames before construction of enclosing walls and ceilings.

C. Field apply bituminous coating to backs of frames that will be filled with grout. Install door silencers in frames before grouting.

D. Where grouting is required in masonry installations, frames shall be braced or fastened in such a way that will prevent the pressure of the grout from deforming the frame members. Grout shall be mixed to provide a 4 inch maximum slump consistency, hand trowelled into place. Grout mixed to a thin “pumpable” consistency shall not be used.

E. Frame Insulation: Install insulation in frames of gypsum board partitions. Cut insulation to full width of frame throat and friction fit within the jamb and head. Pack solid around perimeter of the frame.

F. Anchor bottom of frames to floors with expansion bolts, or with power fasteners. Build wall anchors into walls or secure to adjoining construction as indicated or specified. Where frames require ceiling struts or other structural overhead bracing, they shall be anchored securely to ceiling or structural framing above as indicated and specified.

1. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.

2. In metal-stud partitions, provide at least three wall anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Attach wall anchors to studs with screws.

3. For openings 90 inches or more in height, install an additional anchor at hinge and strike jambs.

G. Install fire-rated frames in accordance with NFPA Standard No. 80.

H. Casings:

1. Installation of wood casings is specified in Section 06 20 00

3.04 DOOR INSTALLATION

A. Door Installation: Comply with ANSI A250.8. Fit hollow metal doors accurately in their respective frames within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G .

B. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

C. Smoke-Control Doors: Install to comply with NFPA 105.

3.05 ADJUSTMENT

A. Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection.

B. Remove and replace defective work including doors or frames which are warped, bowed, or otherwise damaged.

C. Finished Doors: Refinish or replace doors damaged during installation.

D. Protect doors as recommended by door manufacturer to ensure that doors will be without damage or deterioration at time of Substantial Completion.

3.06 TOUCH-UP

A. Prime-Coat Touchup: Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of compatible air-drying primer.

B. Repairs: Fill surface depressions with metallic paste filler, allow to cure, and sand flush for invisible joint with adjacent metal surfaces. Sand rust areas and apply touch-up paint using air drying paints compatible with shop finish. Damaged doors or frames that cannot be repaired shall be replaced.

3.07 INSPECTION

A. Inspection: General Contractor shall provide in writing to Owner an inspection of all steel doors and frames for conformance to specifications. Inspection shall include checking for fit tolerance plumb and level as well as proper hardware and operation.

1. Comply with the requirements of the International Building Code with testing in accordance with UL 10C for positive pressure door test.

a. Doors shall be labeled to certify compliance.

b. Provide installation instructions attached to each door in a manner that assures availability to the installer and building official.

3.08 CLEANING:

A. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

B. Upon completion, metal surfaces of doors and frames that are completely factory finished shall be thoroughly cleaned and touched-up as recommended by the door manufacturer.

END OF SECTION

SECTION 08 14 00

WOOD DOORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Types of doors required include the following:

a. Solid Core Wood Doors with Plastic Laminate Faces.

1) Closet Swing Door with interior mirror

b. Solid Core Wood Doors with Thermoset Decorative Overlay Faces.

c. Solid Core Wood Doors with Vinyl Acrylic Clad Faces

1) Kitchen-to-Buffet Door.

B. Related Sections:

1. Section 06 10 00 - Rough Carpentry
2. Section 06 20 00 - Finish Carpentry
3. Section 08 11 13 – Hollow Metal Doors and Frames
4. Section 08 71 00 - Door Hardware
5. Section 08 80 00 - Glazing

1.02 REFERENCES

A. ANSI/Window and Door Manufacturers Association (WDMA) Publications:

1. I.S.1A "Industry Standard for Interior Architectural Wood Flush Doors

B. American National Standards Institute (ANSI) Publications:

1. ANSI/AHA A135.4 "Basic Hardboard"
2. ANSI 208.1 "Standards for the Performance of Particleboard"
3. ANSI Z97.1 "Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings"

C. ASTM International (ASTM) Publications:

1. C920 “Standard Specification for Elastomeric Joint Sealants”
2. C1036 “Standard Specification for Flat Glass”
3. E90 “Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements”
4. E413 “Classification for Rating Sound Insulation”

D. Door and Hardware Institute (DHI) Publications:

1. DHI-WDHS-3 "Recommended Locations for Architectural Hardware for Wood Flush Doors"

E. National Electrical Manufacturers Association (NEMA) Publications:

1. NEMA LD-3 High-Pressure Decorative Laminates (HPDL)

F. National Fire Protection Association (NFPA) Publications:

1. NFPA 80 “Standard for Fire Doors, Fire Windows”

G. Underwriter's Laboratories, Inc. (UL) Standards

1. UL 10B "Standard for Fire Tests of Door Assemblies"

2. UL 10C "Positive Pressure Fire Tests of Door Assemblies"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.

2. Shop Drawings: Submit Shop Drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.

a. Submittals shall use the same designations for door and hardware numbers as shown on the Drawings.

1.04 QUALITY ASSURANCE

A. Quality Standards: Comply with the following standards:

1. ANSI/WDMA I.S.1A "Industry Standard for Interior Architectural Wood Flush Doors

B. Sound Transmission Class:

1. All guestroom entrance doors from interior corridors, together with their perimeter seals shall have a minimum Sound Transmission Class (STC) of [31] per ASTM E413. when tested in an operable condition according to ASTM E90.

2. All guestroom communicating doors, at each of the two doors in the opening, together with their perimeter seals shall have a minimum Sound Transmission Class (STC) of [35] per ASTM E413. when tested in an operable condition according to ASTM E90.

3. All other entrance doors from interior corridors, together with their perimeter seals shall have a minimum Sound Transmission Class (STC) of [26] per ASTM E413. when tested in a fixed position according to ASTM E90.

C. Safety Glass: Refer to Section 08 80 00 – Glazing.

D. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80, are identical in materials and construction to units tested in door and frame assemblies per ASTM E152, and which are labeled and listed for ratings indicated by Underwriters Laboratory (UL), Warnock Hersey, ETL SEMKO division of Intertek (WHI), or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Provide rated stiles on fire rated doors.

2. Comply with the requirements of the International Building Code with testing in accordance with UL 10C for positive pressure door test.

a. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.

b. Doors shall be labeled to certify compliance.

c. Provide installation instructions attached to each door in a manner that assures availability to the installer and building official.

E. Manufacturer: Obtain doors from one source.

1.05 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 referenced WDMA standard, as well as with manufacturer's instructions.

1. Individually Package doors in vented poly bags with identifying marks prior to shipment. Doors shall not be removed from bags until ready to hang. After hanging, bags shall be placed over doors to provide protection until area in which doors are hung is free of construction traffic.

2. Store doors off the floor at least 3" in an area that is not susceptible to standing water or high moisture. Store doors in an upright position with spacers or corner caps separating each door.

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.

1.06 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until building is enclosed, wet work is complete, and 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:

1. Referenced WDMA quality standards and the manufacturer’s recommendations.

1.07 SPECIAL WARRANTY

A. General: Warranties shall be in addition to and run concurrent with, and not be 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 General Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) more than 1/4 inch in a 42" x 84" section, or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3 inch span, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include reinstallation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

2. Warranty shall be in effect during the following period after date of Substantial Completion:

a. Solid-Core Interior Doors: Life of installation.

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 DISTRIBUTORS

A. Avendra, LLC Preferred Distributor:

1. Contract Hardware, Inc. (800-266-3418)

a. Contact: Mark Tew

2.02 SOLID CORE DOORS, PLASTIC LAMINATE FACED

A. Approved Manufacturers:

1. Assa Abloy (641-423-1334)

a. Graham Flush Wood Doors

2. Eggers Industries (920-793-1351)

3. Lynden Door (800-631-3667)

a. Distribution strength is Northwest United States & Canada.

4. Masonite Company (877-332-4484)

a. Mohawk Flush Doors,

b. Marshfield Door Systems,

5. VT Industries Inc. (800-827-1615)

a. Contact: John Hill (712-369-0553), jhill@vtindustries.com

B. Plastic Laminate Faces: NEMA LD-3, General Purpose 0.050 inch HPDL, Grade 50, color and pattern as shown on Interior Finish Index. .

C. WDMA Performance Duty Level: Heavy Duty

D. Construction: PC-HPDL-3 (3-ply, particle board core)

E. Core: Particleboard, ANSI/208.1, 1-LD-2

F. Thickness: 1-3/4"

G. Factory seal top and bottom rails.

H. Facing Adhesive: Type I - Water-proof.

I. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors as follows:

1. Top Rail (No Closer): Minimum 1-1/8 inch.

2. Top Rail (Closer): Minimum 5-inch remaining after installation. Verify with closer manufacturer.

3. Bottom Rail: Minimum 1-1/8 inch after undercut.

4. Bottom Rail: 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.

5. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices at location of exit device.

6. Stiles: Hardwood or structural composite lumber, minimum 1-3/8" wide before sanding. Plastic-laminate matching faces, applied before faces.

J. Fire-Rated Solid Core Laminate Doors: Comply with the following requirements.

1. Faces: Provide faces to match non-rated doors in same area of building, unless otherwise indicated.

a. Construction: Manufacturer's core construction as required to provide fire-resistance rating indicated.

2. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors or as required to meet specified fire rating and as follows:

a. Top Rail (No Closer): Minimum 1-1/8 inch.

b. Top Rail (Closer): Minimum 5-inch remaining after installation. Verify with closer manufacturer.

c. Bottom Rail: Minimum 1-1/8 inch after undercut.

d. Bottom Rail: 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.

e. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices at location of exit device.

3. Stiles: Provide stiles consisting of two plys.

f. The inner-ply shall be minimum 1-3/8 inches Structural Composite Lumber (SCL) or approved non-combustible material on 20 minute rated doors. On 45, 60, and 90 minute rated doors, the inner-ply shall be 1-inch of Structural Composite lumber or approved combustible material.

g. The outer-ply shall be of plastic laminate to match faces of door. Laminate edge to be applied before the face laminate.

h. Pairs: Provide fire-rated pairs with fire-retardant stiles matching plastic laminate that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.03 PREHUNG SOLID CORE CLOSET SWING DOOR WITH INTERIOR MIRROR, PLASTIC LAMINATE FACED, COMPLETE WITH DOOR HARDWARE

A. Approved Manufacturers:

1. "Model: AC1001CL" Architectural Concepts (888-248-2724)

B. Plastic Laminate Faces: NEMA LD-3, General Purpose 0.050 inch HPDL, Grade 50, color and pattern as shown on Interior Finish Index.

1. WDMA Performance Duty Level: Heavy Duty
2. Construction: PC-HPDL-3 (3-ply, particle board core)
3. Core: Particleboard, ANSI/208.1, 1-LD-2
4. Thickness: 1-3/4"
5. Factory seal top and bottom rails.
6. Facing Adhesive: Type I - Water-proof.
7. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors.

C. Mirror:

1. Mirror Facing: Smooth-edged, silvered, mirrored, vinyl-backed safety glass complying with CPSC 16 CFR 1201 for Category II safety glass with ANSI Z97.1 test procedures; with ASTM C1036 for Type I (transparent, flat), Class 1(clear), Quality q2 (mirror) annealed float glass; with FS DD-M-411 for coating system applied to second glass surface.
2. Glass Thickness: 1/4" thickness each

D. Hardware:

1. Hardware:
2. Hinges: 3 each 4.5 x 4.5, ball bearing hinge (626) finish
   a. 1 – Passage Lock
   b. 1 Wall Stop
   c. 3 Door Silencers (Gray Finish)
   d. 3 Way catch (Trimco 804)
   e. Pull: ACM06312 (626) Finish

2.04 SOLID CORE DOORS, VINYL-ACRYLIC-FACED

A. Approved Manufacturers:

1. "Acrovyn Door" by Construction Specialties, Inc. (800-416-6586)
2. "Palladium Door" by Eggers Industries (920-793-1351)

B. Faces: Rigid vinyl sheet, 0.040" minimum thickness, complying with the following:

1. Abrasion resistance (ASTM D4060): Exceeding 6000 cycles without evidence of wear,
2. Gardner Impact Resistance (ASTM D4226): 100% passing @96 in/lbs.
3. Color: As shown on Interior Finish Index. Wood grain pattern to provide appearance of one entire wood veneer, book matching or slip matching appearance is not acceptable

C. WDMA Performance Duty Level: Extra Heavy Duty.

D. Construction: Particleboard core (up to 20-minute rating) with 1/11" high-density fiberboard crossbanding and removable edge.

E. Thickness: 1-3/4"

F. Factory seal top and bottom rails.

G. Blocking: Provide either hardwood or structural composite lumber wood blocking in particleboard-core doors as follows:

1. Top Rail (No Closer): Minimum 1-1/8 inch.

2. Top Rail (Closer): Minimum 5-inch remaining after installation. Verify with closer manufacturer.

3. Bottom Rail: Minimum 1-1/8 inch after undercut.

4. Bottom Rail: 5-inch bottom-rail in doors indicated to have kick, mop, or armor plates.

5. Midrail: 5-inch midrail blocking, in doors indicated to have exit devices devices at location of exit device.

H. Stiles:

1. Hardwood or structural composite lumber, minimum 1-3/8" wide before sanding.

2. Replaceable primary vertical door stile shall be replaceable in the field and shall include ¼-inch radius edges. Square edges are not acceptable.

I. Replaceable Door Edges: Door edge shall be replaceable, exclusive of fasteners, flush with face of door and include ¼-inch radius edges. Square edges are not acceptable. Edges to be provided as part of the construction of the door from the manufacturer.

1. Door edge shall be replaceable, exclusive of fasteners, flush with face of door and include ¼-inch radius edges. Square edges are not acceptable. Edges to be provided as part of the construction of the door from the manufacturer.

2. Edges of doors to be of the following material:

a. Extruded Vinyl Acrylic: .060-inch wood grain pattern to match door faces.

J. Lite Frames:

1. Wood framed lite kits shall be provided and installed by the manufacturer or by a certified machining distributer.

2. Lite Size: 9-inches wide by 14-inches high.

3. Frame to be finished to match door faces.

2.05 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors:

1. Wood Species: Same species as door faces, painted to match laminate at laminate doors.

2. Profile: Flush rectangular beads.

3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire Doors: At fire-rated door locations except, 20-minute rated doors, provide manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire rating indicated. Include concealed metal glazing clips where required for opening size and fire rating indicated.

C. Refer to Section 08 80 00 for glazing.

2.06 FABRICATION - GENERAL

A. Fabricate wood doors to produce doors complying with following requirements:

1. Fabricate fire rated doors in accordance with referenced WDMA Standards and to UL or Warnock Hersey, ETL SEMKO division of Intertek (WHI) requirements. Attach fire rating label to door and frame.

2. Stiles, rails and core shall be fully bonded together with adhesive and sanded smooth prior to laminating of face veneer.

3. Cross bands and faces for PC and FD type doors shall be laminated to core by the hot or cold plate process.

4. Solid Core Doors for Laminate Finish:

   a. Vertical Exposed Edge of Stiles: Plastic laminate same as door facing.

   b. Laminate edge to be applied before the face laminate.

5. Factory-prefit and pre-machine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:

   a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.

   b. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

   c. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

   d. Factory drill pilot holes for hinge and lock face plate screws.

   e. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory pre-machining.

6. Undercut:

   a. Guestroom Entry Door = 1/4" above threshold.

   b. Guestroom Connector = 1/2" above threshold as coordinated with door bottom. (15/16" above concrete)

   c. Guest Bathroom Door = 3/8" above threshold.

   d. Doors swinging over carpet = 3/4" above top of concrete subfloor.

B. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

1. Light Openings: Trim openings with moldings of material and profile indicated.

2. Louvers: Factory install louvers in prepared openings.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails.

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.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation see Section 08 71 00 “Door Hardware”.

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced AWI standard and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

C. Job-Fit Doors:

1. Field-verify dimensions of each new installed door frame; trim each door as required to properly fit each frame within specified dimensional tolerances; unequal trimming may be required.

2. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and matching.

   a. Trim non-rated doors equally from both sides when fitting for width and from top and bottom when fitting for height. Do not trim more than 3/4" from each edge.

3. Fitting Clearances for Non-Rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

4. Fitting Clearances for Fire-Rated Doors: Complying with NFPA 80.

5. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.

6. Bevel fire-rated doors 1/8" in 2" at lock edge, trim stiles and rails only to extent permitted by labeling agency.

D. Hang doors and adjust for proper clearances and smooth operation without binding.

1. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

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

3.03 INSPECTION

A. General Contractor shall provide in writing to Owner's Representative, an inspection of all doors and frames for conformance to specifications. Inspection shall include checking for fit tolerance, plumb and level, as well as proper hardware and operation.

3.04 ADJUSTING, CLEANING, AND PROTECTION

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

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Clean door and dry wipe with a soft cloth.

D. After installation, protect doors from damage as recommended by manufacturer during subsequent construction activities. Damaged doors will be rejected and shall be replaced at no additional cost to Owner.

E. Clean mirrors using cleaning compounds that will not damage mirrors, door finishes or adjacent materials.

F. Protect mirrors and doors from damage. Replace damaged units at no cost to the Owner.

END OF SECTION

SECTION 083113

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes access doors and frames for walls and ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of access door and frame indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material in specified finish.

D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 for vertical access doors and frames.
2. UL 263 for horizontal access doors and frames.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

C. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating.

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

1. Factory-Primed Finish: Manufacturer's standard shop primer.

F. Drywall Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet to receive joint compound.

G. Plaster Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet with flange of expanded metal lath.

H. Manufacturer's standard finish.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

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

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

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. J. L. Industries, Inc.
4. Nystrom, Inc.
5. Williams Bros. Corporation of America (The).

C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal.
3. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with drywall plaster bead flange.
4. Hinges: Spring-loaded, concealed-pin type.
5. Latch: Cam latch with interior release.

D. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch (0.9 mm).
5. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-inch- (25-mm-) wide, surface-mounted trim.
6. Hinges: Concealed-pin type.
7. Automatic Closer: Spring type.
8. Latch: Self-latching device operated by flush key with interior release.
9. Lock: Self-latching device with mortise cylinder lock.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

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

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

END OF SECTION 083113

SECTION 084113

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Exterior windows.
3. Exterior manual-swing entrance doors and door frame units.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferring to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    d. Noise or vibration created by wind and by thermal and structural movements.
    e. Loosening or weakening of fasteners, attachments, and other components.
    f. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind Loads: Per IBC current applicable edition with current state amendments.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
2. Test Durations: 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa).

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

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

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Samples: For each type of exposed finish required.

D. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Product test reports.

G. Field quality-control reports.

H. Maintenance data.

I. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

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

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and Minnesota Building Code Chapter 1341.

E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

F. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 1 year from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide Kewneer Encore 6” x 1 ¾” insolated entrance with encore thermal storefront system. See drawings for frame sizes and profile or comparable product by one of the following:

1. EFCO Corporation.
2. Tubelite.
3. United States Aluminum.
4. Quaker Windows E300 series alternate for guestroom windows only.

2.2 MATERIALS

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

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

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

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

2.3 FRAMING SYSTEMS

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

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center or front edge. See drawings for type.

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

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

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2” Exterior and 1 ¾” interior overall thickness, with minimum 0.125-inch- (3.2-mm thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: See drawings for size and profile..

    a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware and entrance door hardware sets indicated in the Hardware section Division 08., for each entrance door to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:
    a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion and not more than 15 lbf (67 N) to open the door to its minimum required width.

B. Opening-Force Requirements:

1. Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.

2.7 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

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

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

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

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

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

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

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

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

2.9 ALUMINUM FINISHES

A. Exposed Aluminum: clear anodized to an NAAMM AA-M10-C22-A41, Architectural Class 1 coating (thickness: 0.7 mils, minimum).

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.2 ENTRANCE DOOR HARDWARE SETS

A. See Door Schedule.

END OF SECTION 084113

SECTION 084229

AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior and interior, sliding, power-operated automatic entrances.

1.2 PERFORMANCE REQUIREMENTS

A. Opening-Force Requirements:
   1. Power-Operated Doors: Not more than 50 lbf (222 N) required to manually set door in motion if power fails, and not more than 15 lbf (67 N) required to open door to minimum required width.
   2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf (222 N) required for a breakaway door or panel to open.
   3. Accessible Interior Doors: Not more than 5 lbf (22 N) to fully open door.

B. Entrapment Force Requirements:
   1. Power-Operated Sliding Doors: Not more than 30 lbf (133 N) required to prevent stopped door from closing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For automatic entrances. Include plans, elevations, sections, details, hardware mounting heights, wiring safety devices, and attachments to other work.

C. Sample: For each exposed product and for each color and texture specified.

1.4 QUALITY ASSURANCE

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

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Power-Operated Door Standard: BHMA A156.10.

D. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

E. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: One year from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

C. Glazing: As specified in Division 08 Section.

D. Sealants and Joint Fillers: As specified in Division 07 Section "Joint Sealants."

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

2.2 SLIDING AUTOMATIC ENTRANCES

A. General: Provide manufacturer's standard automatic entrances including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.

B. Sliding Automatic Entrance as listed in the drawings and door schedule:
   a. Manufacturers: Subject to compliance with requirements, provide product noted on exterior building elevation drawings or comparable product by one of the following: Double Sliding Units:
      1) Besam Automated Entrance Systems Inc.; An ASSA Abloy Group.
      2) DORMA Automatics; Div. of DORMA Group North America.
      3) Horton Automatics; Div. of Overhead Door Corporation.
      4) Stanley Access Technologies; Div. of The Stanley Works.

   2. Configuration: single sliding door with sidelite.
      a. Emergency Breakaway Capability.
      b. Mounting: Between jambs.

   3. Operator Features:
      a. Power opening and closing.

b. Drive System: Manufacturer standard.
c. Adjustable opening and closing speeds.
d. Adjustable hold-open time between 0 and 30 seconds.
e. Obstruction recycle.
f. On-off/hold-open switch to control electric power to operator.

4. Sliding Door Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.
5. Sliding Door Threshold: Manufacturer's standard threshold members and bottom-guide track system, with stainless-steel, ball-bearing-center roller wheels.
6. Activation Device: Motion sensors mounted on door header to detect pedestrians in activating zone to activate door operator.
7. Safety Devices: Presence sensor mounted to underside of door header to detect pedestrians in presence zone and to prevent door from closing.
8. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.
9. Finish: Finish framing, door, sidelite, and header with finish matching adjacent storefront framing.

2.3 ENTRANCE COMPONENTS

A. Framing Members: Manufacturer's standard extruded aluminum, minimum 0.125 inch (3.2 mm) thick and reinforced as required to support imposed loads. Size and finish to match storefront system.

B. Stile and Rail Doors: Manufacturer's standard 1-3/4-inch- (45-mm-) thick, glazed doors with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails. Glazing stops, stiles and rails size and finish to match storefront system.

C. Sidelite: Manufacturer's standard 1-3/4-inch- (45-mm-) deep sidelite with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members matching door design and finish.

D. Headers: Fabricated from minimum 0.125-inch- (3.2-mm-) thick, extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

E. Signage: Affixed to both sides of each door as required by applicable IBC for type of door and its operation. Signage size, type, and location to be approved by Architect prior to install.

2.4 DOOR OPERATORS AND ACTIVATION AND SAFETY DEVICES

A. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of not less than 2 to 10 seconds.

C. Presence Sensors: Self-contained, infrared-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of not less than 2 to 10 seconds. Sensors shall remain active at all times.

D. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.5 HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish unless otherwise indicated.

B. Breakaway Device for Power-Operated Doors: Provide breakaway device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Maximum force to open door shall be 50 lbf (222 N) according to BHMA A156.10. Interrupt powered operation of door operator while in breakaway mode.

C. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch- (25-mm-) long throw bolt; BHMA A156.5, Grade 1.

D. Weather Stripping: Manufacturer's standard replaceable components.

E. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket.

2.6 FABRICATION

A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

B. Activation and Safety Devices:
   1. General: Factory install devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
   1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
   2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.

C. Door Operators: Connect door operators to electrical power distribution system. (Installed by electrical contractor).

D. Access-Control Devices: Connect access-control devices to access-control system (Installed by electrical contractor).

E. Activation and Safety Devices: Install and adjust devices to provide detection field and functions indicated.

F. Guide Rails: Install rails according to BHMA A156.10 including Appendix A and manufacturer's written instructions unless otherwise indicated.

G. Glazing: Install glazing as specified in Division 08 Section.

H. Sealants: Comply with requirements specified in Division 07 Section "Joint Sealants" to provide weathertight installation.

I. Signage: Apply signage on both sides of each door and breakaway sidelight as required by referenced door standards.

J. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Adjusting: Adjust door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in BHMA A156.10.

END OF SECTION 084229

SECTION 08 51 13

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Operating Aluminum Window Units
2. Fixed Aluminum Window Units
3. Perimeter Sealant
4. Glass and Glazing
5. Wood Blocking, Shims, Anchors, Clips, and all accessories necessary for a complete installation.
6. All Aluminum Trim and Closure Pieces
7. All Operable Window and Door Hardware

B. Related Sections:

1. Section (07 62 00) - Sheet Metal Flashing and Trim
2. Section (07 92 00) - Sealants
3. Section (08 41 13) - Aluminum Entrances and Storefront
4. Section (08 80 00) - Glazing

1.02 SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section (01 33 00) - with the following supporting data:

1. Submit Shop Drawings and product data that include wall opening and component dimensions; wall opening tolerances required; anchorage and fasteners; affected related work; and installation requirements and instructions.
    a. Provide samples of materials as may be requested without cost to Owner, i.e., metal, glass, fasteners, anchors, frame sections, mullion section, etc.
2. Manufacturer shall approve Shop Drawings in writing to insure proper product application.

1.03 DEFINITIONS

A. Performance grade number, included as part of the ANSI/AAMA/NWWDA 101/I.S.2-97 product designation code, is actual design pressure in pounds force per square foot used to determine structural test pressure and water test pressure.

1.04 QUALITY ASSURANCE

A. All window units shall be manufactured by a single source.

1. All windows in any one project must be by the same manufacturer and with comparable frame depth, profile, glazing bite and installation requirements. Manufacturer must provide a window system that can incorporate all window configurations used on the project.

B. Standards: Requirements for aluminum windows, terminology and standard of performance, and fabrication workmanship are those specified and recommended in ANSI/AAMA/NWWDA 101/I.S.2-97 and applicable General Recommendations published by ANSI/AAMA/NWWDA 101/I.S.2-97 and AA. All testing shall be conducted using ANSI/AAMA/NWWDA 101/I.S.2-97 Gateway Performance

minimum specified test sizes.

C. Certify that windows have been tested in accordance with American Architectural Manufacturers Association (AAMA/NWWDA) Specification for Performance Class specified complying with the following performance standards:

1. ANSI/AAMA/NWWDA 101/I.S.2-97 Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with ANSI/AAMA/NWWDA 101/I.S.2-97.
   a. Performance Grade: CW30 or better
2. Uniform Structural Properties (ASTM E330): Pressure acting inward and outward. Window to be operable and maximum .4% permanent deformation, per member, when tested at a static air pressure difference of 60.0 PSF
3. Water Resistance (ASTM E331 and ASTM E547): No water penetration at test pressures 6.00 PSF
4. Air Leakage (ASTM E283):
   a. Sliding Windows: Maximum 0.37 CFM per sq./ft. of total exterior surface area, when tested at a static air pressure difference of 1.57 PSF minimum .
   b. Fixed Windows: Maximum 0.15 CFM per sq. ft. of total exterior surface area, when tested at a static air pressure difference of 1.57 PSF minimum.
   c. Forced Entry Resistance (ASTM F588): To performance level 10.
5. U-Factor: 0.38 maximum
6. SHGC: 0.40 maximum
7. VF: 0.80
8. Acoustic windows: windows noted on the drawings as “Acoustic” shall have a minimum STC value of 42.

D. Insulating glass shall comply with standardfor construction and insulating value as established by:

1. Sealed Insulating Glass Manufacturer's Association (SIGMA).
2. Insulating Glass Certification Council (IGCC).

E. Glazing and Sealant: Per manuals published by the Flat Glass Marketing Association (FGMA). Glazing and sealant to match approved colors for all aluminum framing.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Transportation and Handling: Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging. Provide equipment and personnel to handle products by method to prevent soiling or damage. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

B. Storage and Protection: Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain with temperature and humidity ranges required by manufacturer's instruction.

PART 2 **PRODUCTS**

2.01 MATERIALS

A. Window Units:

1. Basis of design: Wojan Window & Door Corporation M-950 series

B. All fasteners, tools, equipment, and other materials necessary for a complete installation shall be furnished by this Contractor.

1. Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with all window members, cladding, trim, hardware, anchors, and other components

C. Insect Screens: Provide removable insect screen panel for each moveable glazed sash.

1. Screen Fabric: 18 by 16 mesh of 0.013" diameter aluminum wire. Comply with FS-RRW-365, Type VII, except black anodized or "gun metal" coating on wire.
2. Screen Frame: Provide formed or extruded aluminum frames and removable vinyl fabric-retainer spline.
    a. Finish shall match window.

D. Accessories:

1. Safety Device Stops: For operable windows, provide stops to prevent opening greater than 4". Stops shall be constructed of stock window frame material and attached with tamper-resistant screws. .
    a. Sills: Manufacturer's standard exterior sills with manufacturer’s standard slide in nailing fin at EIFS openings, type as shown on Drawings.
2. Trim: Manufacturer's standard interior snap trims, type as shown on Drawings.

E. Hardware:

1. Sash lock: Manufacturers' standard.
2. Wheels and Sliding Mechanism: Manufacturer's standard.

F. Maximum operating force: once sash in motion:

1. Horizontal Sliding Windows: 20 LBF

2.02 GLASS MATERIALS

A. Glass [I]: Clear Float Glass: ASTM C1036, Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), as manufactured by one of the following:

1. Approved Manufacturers:
    a. PPG Industries Inc., Glass Group (800-377-5267)
    b. AFG Industries, Inc. (800-251-0441)
    c. Viracon, Inc. (800-533-2080)
    d. Guardian Industries, (248-340-1800)
    e. Approved Substitution by Window Manufacturer.

B. Glass [II]: Tempered Glass: 1/4", Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3, clear, fully tempered safety glass (meet requirements of ANSI Z97.1).

1. All tempered glass shall conform to ASTM C1048, ANSI Z97.1, and CPSC 16 CFR Part 1201. Tempered glass shall bear permanent monogram indicating tempered quality. Fabrication marks on tempered glass shall be located to be concealed in completed installation.
2. Color: Clear to match aluminum windows glazing, Section 08 51 13.

C. Glass [III]: Coated Low Emissitivity Glass: 1/4", Condition C (other coated glass), Type I (transparent glass, flat), Class I (clear), Quality q3 (glazing select).

D. Approved Manufacturers:

    a. "Sungate 500 Low-E Glass"; PPG Industries Inc., Glass Group (800-377-5267)

b. "Energy Advantage Low-E"; Pilkington North America (419-247-3201)
c. "Comfort E2"; AFG Industries, Inc. (800-251-0441)
d. Approved Substitution by Window Manufacturer.

E. Windows shall be glazed as follows:
1. Insulating Glass: Units designed to conform to required STC and thermal ratings, as approved by the Architect.
2. Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for performance classification indicated as well as with other requirements specified for glass characteristics, air, space, sealing system, sealant, space material, and desiccants.
3. PERFORMANCE REQUIREMENTS
a. Total Thickness: 1"
b. Exterior Pane: Bronze tinted annealed
(1) Laminated where necessary for acoustic performance
c. Interior Pane: Low E annealed
1) Laminated where necessary for acoustic performance
d. Sealing System: Manufacturer's Standard Dual Seal
e. Desiccant: Manufacturer's Standard - Either Molecular Sieve or Silica Gel or Blend of Both
f. Spacer Material: Manufacturer's Standard Metal, with Bronze Anodized Finish.
g. U-factor: 0.38 max.
h. SHGC value:
1. 0.53 for north-facing windows (contractor's option; otherwise 0.40)
2. 0.40 for all other windows
i. VT: 0.80
j. Provide Tempered Glass where shown on Drawings and as required by local Codes and Ordinances.

2.03 FINISHES

A. All exposed aluminum surfaces shall have a manufactured-applied, 15 -year warrantied, Kynar 500 fluorocarbon finish containing 70% fluoropolymer, free from blemishes and surface defects which meets AAMA 2605-98 specifications.
1. Color to be as shown on Exterior Finish Index.

2.04 FABRICATION

A. Fabricate windows allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation.

B. Rigidly fit joints and corners. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal corner joints with sealant.

C. Develop drainage holes with moisture pattern to exterior.

D. Prepare components to receive anchor devices. Fabricate anchorage items.

PART 3 **EXECUTION**

3.01 INSTALLATION - GENERAL

A. Installation Details: Before proceeding with the manufacturing of the windows and doors, the Window

Contractor shall submit complete installation details for the Owner's representatives approval. These Drawings shall show elevations of windows, full-sized details of all sections of windows, collateral materials and details of anchorage. Supplemental data shall contain calculations of moments of inertia on frames and mullion connections plus instructions for storage, handling, and erection of windows and sliding doors. Conform to AAMA2400 for Nail Fin Installation.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

C. Beginning of installation means acceptance of existing conditions.

D. Align window frame plumb and level, free of wrap or twist. Maintain dimensional tolerances, aligning with adjacent work.

E. Coordinate attachment and seal of air and vapor barrier materials. Install under sill flashings, if required.

F. Pack fibrous insulation in shim spaces at perimeter to maintain continuity of thermal barrier.

G. Install perimeter sealant, backing materials, and installation requirements in accordance with Section 07 92 00. Apply sealant to ends of sill for watertight seal.

H. Windows shall be installed by experienced workmen in exact accordance with the manufacturer's instructions and approved Shop Drawings.

I. Erection Tolerances:
   1. Maximum deviation from established vertical or horizontal reference lines:
      a. 1/8 inch per 12 feet of length of any member.
      b. 1/4 inch in any continuous run.
   2. Maximum offset from true alignment between two adjoining members in line, end to end, 1/16 inch.

J. Adequately anchor frames to surrounding construction. Place anchors at 2'-0" on center maximum or as required to maintain position of frames when subjected to thermal and building movement and specified wind load.
   1. Anchorage method to be integral nailing fin.

3.02 ADJUSTING AND CLEANING

A. After completion of window installation, windows shall be inspected, adjusted, put into working order and left clean, free of labels, dirt, etc. Protection from this point shall be responsibility of General Contractor.

B. Remove protective material from prefinished aluminum surfaces.

C. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. All the finish hardware including all screws, bolts, and other devices required to complete the work.
2. Lock cylinders for locks specified in other Sections.
3. Miscellaneous hardware.
4. Hardware furnished for shop or factory installation on doors and frames.
5. Keys and Keying.

B. Related Sections:

1. Section 08 11 13 - Steel Doors and Frames
2. Section 08 14 00 - Wood Doors
3. Section 08 41 13 - Aluminum-Framed Entrances and Storefronts
4. Section 25 51 10 – Integrated Automation Control of Guestroom Equipment
5. Division 26 Sections - Coordination with items requiring electrical connections.

1.02 REFERENCES

A. Perform all work in accordance with the following:

1. American National Standards Institute (ANSI) Publications:
   a. ICC A117.1-2009 “Accessible and Useable Buildings and Facilities”
   b. ANSI/BHMA A156.1 "Butts & Hinges"
   c. ANSI/BHMA A 156.2 "Bored and Preassembled Locks and Latches"
   d. ANSI/BHMA A 156.3 "Exit Devices"
   e. ANSI/BHMA A 156.4 "Door Controls - Closers"
   f. ANSI/BHMA A 156.5 "Auxiliary Locks and Associated Products"
   g. ANSI/BHMA A 156.6 "Architectural Door Trim"
   h. ANSI/BHMA A 156.13 "Mortise Locks & Latches"
   i. ANSI/BHMA A 156.17 "Self-Closing Hinges & Pivots"
   j. ANSI/BHMA A 156.18 "Materials & Finishes"
   k. ANSI/BHMA A 156.21 "Thresholds"
   l. ANSI/BHMA A 156.22 "Gasketing and Edge Seal Systems"
   m. ANSI/BHMA A 156.23 "Electromagnetic Locks"
   n. ANSI/BHMA A 156.25 “Electrified Locking Devices”
   o. ANSI/BHMA A 156.26 "Continuous Hinges"
   p. ANSI/BHMA A 156.28 "Keying Systems"
2. ANSI/DHI Publications:
   a. ANSI/DHI A115.1G "Installation Guide for Doors and Hardware"
3. Builders Hardware Manufacturers Association (BHMA)
4. Door and Hardware Institute (DHI) Publications:
   a. DHI-WDHS-3 "Recommended Hardware Locations for Wood Flush Doors"
   b. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames"
5. National Fire Protection Association (NFPA) Publications:
   a. 80 “Standard for Fire Doors, Fire Windows”
   b. 101 "Life Safety Code"
   c. 252 “Standard Methods of Fire Tests of Door Assemblies”
6. Underwriter's Laboratories, Inc. (UL) Standards
   a. 10B "Standard for Fire Tests of Door Assemblies"
   b. 10C "Positive Pressure Fire Tests of Door Assemblies"
   c. 305 "Panic Hardware"
7. Window and Door Manufacturers Association (WDMA)

B. Regulatory Requirements:

1. Conform to NFPA 80, and other applicable codes for requirements applicable to fire rated doors and frames.
2. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., and acceptable to the public authority as suitable for the purpose specified and indicated.
3. Conform to requirements of [ANSI ICC A117.1-2009]
4. Accessibility: Hardware for doors used by the disabled shall comply with all state and local codes which shall supersede this Section. Notify the Owner's Representative of conflicts between regulations and this specification prior to providing hardware.
    a. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
    b. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
    a. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
        1) Type, style, function, size, and finish of each hardware item.
        2) Name and manufacturer of each item.
        3) Fastenings and other pertinent information.
        4) Location of each hardware set cross referenced to indications on Drawings both on floor plans and in door and frame schedule. Submittals shall use the same designations for door and hardware numbers as shown on the Drawings.
        5) Explanation of all abbreviations, symbols, and codes contained in schedule.
        6) Mounting locations for hardware.
        7) Door and frame sizes and materials.
        8) Keying information.
3. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.
4. Templates for doors, frames, and other work specified to be factory-prepared for the installation of door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
5. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

1.04 QUALITY ASSURANCE

A. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced Architectural Hardware Consultant (AHC) who is available at reasonable times during the course of the work, for consultation about Project's hardware requirements.

1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.
2. The Guest Room security system shall be installed by a Contractor certified by the manufacturer of the system.

3. Hardware supplier for Guest Room security system shall provide supervision during installation as well as training for Courtyard personnel prior to opening of facility.

B. Fire-rated Openings: Provide door hardware for fire-rated openings that complies with NFPA 80, based on testing per NFPA 252, and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriter's Laboratories, Inc. (UL), Warnock Hersey, ETL SEMKO division of Intertek (WHI), FM Global (FMG), or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

1. Comply with the requirements of the International Building Code with testing in accordance with UL 10C for positive pressure door test.
   a. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
   b. Doors shall be labeled to certify compliance.
   c. Provide installation instructions attached to each door in a manner that assures availability to the installer and building official.

C. Accessibility

1. All work shall conform to the [ANSI ICC A117.1-2009
2. Opening Force: The maximum force for pushing or pulling open doors shall be [5] pounds in accordance with [ANSI ICC A117.1-2009

D. Inspection: General Contractor shall provide in writing to Owner's Representative] an inspection of all doors and frames for conformance to specifications. Inspection shall include checking for fit tolerance plumb and level as well as proper hardware and operation.

E. Installer Certification: When required by manufacturer of certain hardware components, provide written certification that Installer has completed training and is approved by manufacturer for the installations indicated.

1.01 MAINTENANCE

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

1.02 CERTIFICATIONS

A. Conform to governing Building Codes for requirements applicable to the work specified herein.

B. Conform to NFPA 101 with regard to requirements for fire-rated doors and frames.

C. Hardware for doors in accessible locations as defined by the Americans with Disability Act (ADA) shall comply with all state and local codes which shall supersede this section. The [Architect] shall be notified of any conflicts between regulations and the specifications prior to the purchase and installation of any hardware.

1.03 SCHEDULING

A. Reinforcement for all hardware for metal doors and frames shall be installed at the factory and be made to template and furnished with machine screws. The face of locks shall be beveled to match the bevel edge of metal doors. All hardware for the metal doors shall be ordered as soon as possible after the Contract is awarded.

1.04 DELIVERY, STORAGE AND HANDLING

A. Legibly mark and label each package, indicating item and location for which it is intended. Each marking shall correspond to the number shown on the approved hardware schedule. Each package shall contain all the required screws, bolts and fasteners necessary for installation of each hardware item.

1. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
2. Include basic installation instructions with each item or package.

B. Construction keys: Tagged and plainly marked on face of envelope with the key change number, door designation and all other required information and mailed directly to the Owner.

C. Permanent keys: Identified by lock manufacturer and opening to which they apply. Lock manufacturer shall place each set of keys into an envelope and label same with door numbers for rooms or areas. Mark boxes of keys with project name and location and ship Change Keys, Master Keys, and Grandmaster Keys via prepaid registered mail to Owner.

D. Guest Room Security Systems: Guest room card keys, master keys, and maids keys to be keyed in accordance with instructions provided by Owner's Loss Prevention Technical Service Department.

1.05 SPARE MATERIALS

A. Refer to Section 01 78 43 .

1.06 WARRANTY

A. Furnish a written guarantee which shall cover the periods stated below from and after the completion of the building and its acceptance by the Owner.

B. For a period of one (1) year after final acceptance by the Owner. Hardware failing to comply with warranty shall be removed and replaced with new material including labor at no cost to Owner.

C. Provide the following special warranties starting from the date of substantial completion:

1. Door Locksets: Two (2) years.
2. Computer Systems: Two (2) Years .
3. Card Readers and other electrical equipment: Two (2) years.

PART 2 PRODUCTS

2.01 DISTRIBUTORS

A. Avendra, LLC Preferred Manufacturers:

1. Contract Hardware, Inc. (800-266-3418)
   a. Contact: Mark Tew

2.02 MANUFACTURERS

A. Hardware manufacturers are specified for each hardware item to establish a standard of quality and minimum functional requirements. In the hardware schedule at the end of this Section, product model numbers are used as part of this description to assist in identifying individual items.

B. Items of a particular hardware category, i.e., locksets, closers, hinges shall be of the same manufacturer.

C. Avendra, LLC Preferred Manufacturers:

1. None

D. Approved Manufacturers and Abbreviations:

1. ABH Architectural Builders Hardware Mfg., Inc. (630-875-9900)
2.. ARM Adams Rite Manufacturing Co., An ASSA ABLOY Group Company (800-872-3267)
3. AIP Aiphone Corporation (800-692-0200)
4. AAH ASSA ABLOY Hospitality (800-367-8097)
5. CBL Charles Bar-Lok Corp. (708-333-0071)
6. DE Detex Corp. (800-729-3839)
7. DCI Door Controls International (800-742-3634)
8. DOR DORMA Americas a Dormakaba Group Company (800-523-8483)
9. EDL J. G. Edelen Company, Inc. (410-918-1200)
10. FAS Folger Adam EDC, An ASSA ABLOY Group Company (800-260-9001)
11 HAG Hager Companies (800-255-3590)
12. HES HES, An ASSA ABLOY Group Company (800-626-7590)
13. IVES Ives, an Allegion Brand (888-758-9823)
14. JOH Johnson Hardware (800-837-5664)
15. LCN LCN Closers, an Allegion Brand (888-758-9823)
16. MCK McKinney Products Company, An ASSA ABLOY Group Company (800-346-7707)
17. NGP National Guard Products, Inc. (NGP) (800-647-7874)

18. NOR Norton Door Controls, An ASSA ABLOY Group Company (800-438-1951)
19. ONT Onity, A UTC Building & Industrial Systems Company (800-424-1433)
20. PDQ PDQ Manufacturing (800-441-9692)
21. PEM Pemko Manufacturing Company, an ASSA ABLOY Group Company (800-283-9988)
22. PRE Precision Hardware, Stanley Security Solutions, Inc, a Dormakaba Group Company (317-849-2250)
23. PUL JAI PULNiX America, Inc. (800-445-5444)
24. RIX Rixson Specialty Door Controls An ASSA ABLOY Group Company (800-457-5670)
25. RO Rockwood Manufacturing Co., An ASSA ABLOY Group Company (800-458-2424)
26. SAF Saflok, a DormaKaba Group Company (800-999-6213)
27. SAR Sargent Manufacturing Co., An ASSA ABLOY Group Company (800-727-5477)
28. SEC Securitron, An ASSA ABLOY Group Company (800-624-5625)
29. SCH Schlage, an Allegion Brand (888-758-9823)
30. SCE Schlage Electronics, an Allegion Brand (888-758-9823)
31. SIM SimplexGrinnell, A Tyco Company (800-746-7539)
32. STA Stanley Commercial Hardware, a Dormakaba Group Company (860-225-5111)
33. TEL Telkee, Inc (800-950-3226)
34. TLM Tell Manufacturing, Inc (800-433-4047)
35. TRM Trimco/BBW (323-262-4191)
35. TDS Total Door Systems (800-852-6660)
37. VDI Von Duprin, an Allegion Brand (888-758-9823)
38. YAL Yale Commercial Locks & Hardware, An ASSA ABLOY Group Company (800-438-1951)

2.03 GENERAL REQUIREMENTS

A. Electronic Security System Description
   1. General:
      a. Install a network ready electronic lock system, complete and including without limitation, the following components:
      b. Lock Technology: RFID (radio-frequency identification), proximity activated, network ready.
         1) Marriott Mobile Key Certified Model with Blue Tooth Low Energy (BLE) proximity activated lock is required.
   2. Avendra, LLC Preferred Manufacturers:
      a. None
   3. Approved Manufacturers:
      a. "Quantum RFID Lock with BLE x Continental Lever"; Saflok, a Dormakaba Group Company (800-523-9605)
         1) Provide Auto Deadbolt Option (ADB) at all Guestroom Entry Doors
      b. "VingCard Signature RFID with BLE x Wing Lever"; ASSA ABLOY Hospitality (800-367-8097)
         1) Provide Auto Deadbolt Option (ADB) at all Guestroom Entry Doors.
      c. Onity, A UTC Building & Industrial Systems Company (800-424-1433)
         1) Provide Auto Deadbolt Option (ADB) at all Guestroom Entry Doors.
            a) "Onity HT24 Series RFID with BLE"
            b) "Onity HT34 Series RFID with BLE"
            c) "Onity Advance Mag RFID with BLE"
            d) "Onity Advance RFID with BLE"
            e) "Onity Trillium RFID with BLE"
            f) "Onity Advance Trillium RFID with BLE"
      d. No Substitutions
   4. Guest Room Locking System, Front Desk System
      a. Approved Manufacturers:
         1) "System 6000" by Saflok, a Dormakaba Group Company, or one of the following:
         2) "Visionline"; ASSA ABLOY Hospitality (800-367-8097)
         3) "Onity HT24W" Onity, A UTC Building & Industrial Systems Company (800-424-1433)
         4) No Substitutions

b. Microprocessor based Front Desk Controller System shall be a PC based network RFID encoding, handheld unit with lock integration (LPI) feature. Include the following:
   1) [2] Each Network RFID keycard encoder station and power supply.
   2) 1 Each Basic System Items: Manuals, etc.
   3) 1 Each System Printer with Serial Cable
   4) Keycards: Generic reusable plastic RFID keycards. Quantity: 2000.

c. System shall be designed for the following features:
   1) Password access to front desk system
   2) Transaction log of last 4,000 transactions
   3) Simple three-step check in progress
   4) Encoder must encode and validate cards
   5) Encoder must be able to "read a card"
   6) Fail-safe key cards in case of catastrophic power failure
   7) Handheld Unit: Password protected and be able to program up to 50 locks. In addition HHU associated with the Front Desk System. This unit will be used for lock interrogation, diagnostics and programming. Program shall include:
      (a) Set time clock
      (b) Perform diagnostic check
      (c) Interrogate up to last 100 entries: time, date and card identification

d. Guest Room: Locks shall be opened by a correctly coded card, upon placement of card on the RFID reader. Use of a newly issued card shall automatically re-key the lock to void the previous card, and guest cards shall additionally self-cancel by date and time automatically. Perimeter door reader to allow authorized guest cards. Canceled cards must not access perimeter reader.
   1) Audit trail in lock of last 100 entries - time, date, and card identification.
   2) Office/passage function by card for offices, entry doors or hospitality suites.
   3) Reusable ABA or ISO 14443 standard Mifare RFID cards
   4) Three (3) or Four (4) standard AA batteries or a Four (4) AA battery pack.
   5) Non-volatile memory lock will not lose program even if the batteries are removed.
   6) Four (4) levels of master/staff cards; 50 masters per level.
   7) Staff cards shall be individualized to identify individual card holder via lock audit.
   8) All cards are time limited.
   9) For Finish and Lever design see hardware sets.
   10) Deadbolt override cards for emergency level.
   11) Simultaneous retraction of deadbolt and latchbolt (1" steel dead bolt with security pins and 3/4" anti-friction latch bolt).
   12) Intelligent power shutdown feature. Batteries remain deactivated until keycard is inserted. Master level card key will activate a flashing LED “Low Battery” light warning system 30 days in advance of battery failure.
   13) Mortise lockset to conform to BHMP Grade One, and meet UL Fire Rating A (3-Hour) through C (3/4-Hour).
   14) Exterior door applications shall have special weather protection stand.
   15) ANSI grade entry/egress/door ajar tracking mortise.

B. Intercom System:
   1. Products:
      a. Avendra, LLC Preferred Manufacturers:
         1) None
      b. Basis-of-Design Product: Subject to compliance with requirements, provide “LEM-1 DLS System” by Aiphone Corporation.
         1) No Substitutions
   2. Complete intercom system including, but not limited to, master unit, door station, power supply and substations, if applicable.
      a. Master Unit LEM-1
      b. Door Station Transmitter L-ED
      c. Power Supply PT120NS

C. Butt Hinges: Unless otherwise scheduled, shall be five-knuckle, full mortise template, ball bearing type with non-rising loose pin, flat button tip. Exterior hinges, and certain others as scheduled, shall have non-removable pins by use of set screw in the barrel. These are identified in the schedule as "NRP".

1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Butt Hinges listed in hardware sets by McKinney Products Company, An ASSA ABLOY Group Company, or comparable product by one of the following:
      1) Hager Companies
      2) Stanley Commercial Hardware
2. Sizes:
   a. Size of hinges to be 3-1/2" x 3-1/2" for 1-3/8" doors
   b. Size of hinges to be 4-1/2" x 4-1/2" for 1-3/4" doors up to 36" wide; 37" to 48 hinges to be 5" x 4-1/2" unless listed otherwise in hardware sets.

D. Standard Locks and Latches: Locks shall utilize standard cutouts to facilitate interchange without further mortising. Strikes for locks and latches shall have only the minimum lip projection required to protect trim. Lock and trim shall conform to ANSI/BHMA A156.2. Levers shall match Electronic Lock Levers.

1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Butt Standard Locks and Latches listed in hardware sets by Sargent Manufacturing Co., An ASSA ABLOY Group Company, or comparable product by one of the following:
      1) PDQ Manufacturing
      2) Hager Companies
      3) Schlage, an Allegion Brand
      4) Yale Commercial Locks & Hardware, An ASSA ABLOY Group Company
      5) Stanley Commercial Hardware, a Dormakaba Group Company

E. Exit Devices for Exterior Doors and High-Frequency Doors: Shall be listed under "Panic Hardware" in accident equipment lists of Underwriters Laboratories. Where labeled fire doors are used as exits, they shall be equipped with labeled "Fire Exit Hardware". Exit devices shall conform to ANSI/BHMA A156.3

1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Exit Devices listed in hardware sets by Von Duprin, an Allegion Brand, or comparable product by one of the following:
      1) Precision Hardware, Stanley Security Solutions, Inc, a Dormakaba Group Company
      2) Sargent Manufacturing Co., An ASSA ABLOY Group Company
      3) Yale Commercial Locks & Hardware, An ASSA ABLOY Group Company
   c. All exit devices with Electric Latch Retraction feature shall be fail secure unless noted otherwise.

F. Exit Devices for Interior Doors and Standard-Frequency Doors: Shall be listed under "Panic Hardware" in accident equipment lists of Underwriters Laboratories. Where labeled fire doors are used as exits, they shall be equipped with labeled "Fire Exit Hardware". Exit devices shall conform to ANSI/BHMA A156.3

1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Exit Devices listed in hardware sets by Von Duprin, an Allegion Brand , or comparable product by one of the following:
      1) Precision Hardware, Stanley Security Solutions, Inc, a Dormakaba Group Company
      2) Sargent Manufacturing Co., An ASSA ABLOY Group Company
      3) Yale Commercial Locks & Hardware, An ASSA ABLOY Group Company

G. Exit Devices, Low-Profile, for Corridor Pocket Doors: Shall be listed under "Panic Hardware" in accident equipment lists of Underwriters Laboratories. Where labeled fire doors are used as exits, they shall be equipped with labeled "Fire Exit Hardware". Exit devices shall conform to ANSI/BHMA A156.3

1. Products:
    a. Avendra, LLC Preferred Manufacturers:
        1) None
    b. Basis-of-Design Product: Subject to compliance with requirements, provide Exit Devices listed in hardware sets by Adams Rite USA, or comparable product by one of the following:
        1) Total Door Systems
        2) Von Duprin, an Allegion Brand

H. Push/Pulls

1. Products:
    a. Avendra, LLC Preferred Manufacturers:
        1) None
    b. Basis-of-Design Product: Subject to compliance with requirements, provide Psuh/Pulls listed in hardware sets by Trimco/BBW, or comparable product by one of the following:
        1) Ives, an Allegion Brand
        2) Rockwood Manufacturing Co., An ASSA ABLOY Group Company
        3) Hager Companies

I. Electric Strikes

1. Products:
    a. Avendra, LLC Preferred Manufacturers:
        1) None
    b. Basis-of-Design Product: Subject to compliance with requirements, provide Electric Strikes listed in hardware sets by Folger Adam EDC, An ASSA ABLOY Group Company, or comparable product by one of the following:
        1) HES, An ASSA ABLOY Group Company
        2) Von Duprin, an Allegion Brand
    c. All electric strikes shall be fail secure unless noted otherwise.

J. Electromagnetic Hold-Open

1. Products:
    a. Avendra, LLC Preferred Manufacturers:
        1) None
    b. Basis-of-Design Product: Subject to compliance with requirements, provide Electromagnetic Hold-Opens listed in hardware sets by Rixson Specialty Door Controls An ASSA ABLOY Group Company, or comparable product by one of the following:
        1) Architectural Builders Hardware Mfg., Inc.
        2) LCN Closers, an Allegion Brand
        3) Sargent Manufacturing Co., An ASSA ABLOY Group Company
        4) Hager Companies

K. Electric Power Transfer Devices

1. Electric power transfer devices shall be used that may contain one of the following combinations of conductors:
    a. Ten (10) or more conductors minimum 24AWG
    b. Two (2) conductors 18AWG and four (4) conductors minimum 24AWG
2. Power transfer device shall be concealed
3. The power transfer device shall be separate from the door hinges and shall not support any of the door weight.

L. Door Closers (Except for Concealed): Except where other device for automatically closing and controlling the action of swing doors is noted, shall be hydraulic type of rack and pinion design with working parts enclosed in a cast iron or aluminum case. For doors subject to positive or negative HVAC pressures, closer size shall be adjusted accordingly. All Closers shall **NOT** be fastened with Through Bolts through doors. All Wood Doors with closers to be provided with 5" wood top block.

1. Products:
    a. Avendra, LLC Preferred Manufacturers:

1) None

b. Basis-of-Design Product: Subject to compliance with requirements, provide Door Closers listed in hardware sets by Yale Commercial Locks & Hardware, An ASSA ABLOY Group Company, or comparable product by one of the following:
   1) LCN Closers, an Allegion Brand
   2) Sargent Manufacturing Co., An ASSA ABLOY Group Company
   3) Hager Companies
   4) DORMA Americas, a Dormakaba Group Company
   5) Norton Door Controls, An ASSA ABLOY Group Company
   6) Stanley Commercial Hardware, a Dormakaba Group Company

2. Materials and Features:
   a. ANSI/BHMA A156.4, Grade 1
   b. ICC/ANSI A117.1-2009
   c. UL. listed. Provide closers for fire rated openings in compliance with NFPA 80, NFPA 101, and local building codes.
   d. Provide closers with full molded plastic covers
   e. Extreme temperature fluid (temperature range from -30 degrees F to 120 degrees F.)
   f. Provide delayed action closers where required by code
   g. Provide sex nuts and bolts (SNB)) on all labeled mineral core doors.
   h. Finish: Provide factory painted or powder finish on exposed metal to match hardware, unless indicated otherwise.
   i. Mounting: Closers shall be furnished with parallel arm mounting on all doors opening into corridors or other public spaces and shall be mounted to permit 180 degrees door swing wherever wall conditions permit. Closers shall not be installed on exterior or corridor side of doors. Where possible install closers on door for optimum aesthetics.
   j. Size and mount units indicated or, if not indicated, to comply with manufacturer's recommendations for exposure conditions. Reinforce substrate as recommended.
   k. Closers to be installed to allow direction of door swing as shown on Drawings and as required to meet field conditions.
   l. Door pull force:
      1) Exterior Doors: Maximum 8.5 lbs.
      2) Interior Doors: Maximum 5.0 lbs.
   m. Provide mounting or drop plates as required by job conditions.

M. Door Closers (Concealed): Rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Concealed Door Closers listed in hardware sets by Rixson Specialty Door Controls An ASSA ABLOY Group Company, or comparable product by one of the following:
      1) LCN Closers, an Allegion Brand
      2) Sargent Manufacturing Co., An ASSA ABLOY Group Company
      3) Norton Door Controls, An ASSA ABLOY Group Company
2. Materials and Features:
   a. ANSI/BHMA A156.4, Grade 1
   b. ICC/ANSI A117.1-2009
   c. UL. listed. Provide closers for fire rated openings in compliance with NFPA 80, NFPA 101, and local building codes.
   d. Extreme temperature fluid (temperature range from -30 degrees F to 120 degrees F.)
   e. Provide delayed action closers where required by code
   f. Concealed Overhead Closer: Mortised into head frame; with cast-metal body and exposed cover plate.
   g. Size and mount units indicated or, if not indicated, to comply with manufacturer's recommendations for exposure conditions. Reinforce substrate as recommended.

h. Closers to be installed to allow direction of door swing as shown on Drawings and as required to meet field conditions.
i. Door pull force:
1) Exterior Doors: Maximum 8.5 lbs.
2) Interior Doors: Maximum 5.0 lbs.

N. Door Stops: Wall type door bumpers shall be in accordance with ANSI/BHMA A156.16 and provided for all openings where conditions permit. In the event a wall type bumper cannot be used, a floor stop shall be provided

1. Products:
a. Avendra, LLC Preferred Manufacturers:
1) None
b. Basis-of-Design Product: Subject to compliance with requirements, provide Wall or Floor Stops listed in hardware sets by Trimco/BBW, or comparable product by one of the following:
1) Ives, an Allegion Brand
2) Rockwood Manufacturing Co., An ASSA ABLOY Group Company
3) Hager Companies
2. Materials and Features:
a. Door Stop Mounting: Methods to suit substrates encountered (plastic anchor, drywall anchor, expansion shield, etc.).
b. Provide gray rubber exposed resilient parts.
c. Do not furnish aluminum floor stops
d. Adjust height of floor stops to suit undercut of adjacent door.

O. Manual Flush Bolts:

1. Manual Flush Bolts: ANSI/BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.
2. Manual-Extension Flush Bolts: Grade 1, fabricated from extruded brass or aluminum, with 12-inch rod actuated by flat lever; listed and labeled for fire-rated doors, where required. Provide with dustproof strike.
3. Slide Flush Bolts: Grade 1, cast brass, with rod actuated by slide. Provide with dustproof strike.
4. Dustproof Strikes: Grade 1, polished wrought brass, with 3/4-inch- diameter, spring-tension plunger.

P. Automatic And Self-Latching Flush Bolts:

1. Automatic Flush Bolts: Grade 1, fabricated from steel and brass components, with spring-activated bolts that automatically retract when active leaf is opened and that automatically engage when active door depresses bolt trigger; listed and labeled for fire-rated doors where required. Provide brass or stainless-steel cover plate, top and bottom dustproof strikes, guides, guide supports, wear plates, and shims.
2. Self-Latching Flush Bolts: Grade 1, fabricated from steel and brass components, with spring-activated bolts that automatically engage when active door depresses trigger; listed and labeled for fire-rated doors where required. Bolts are manually retracted by a slide in the bolt face. Provide brass or stainless-steel cover plate, dustproof top and bottom strikes, guides, guide supports, wear plates, and shims.
3. Dustproof Strikes: Grade 1, polished wrought brass, with 3/4-inch- diameter, spring-tension plunger.

Q. Door Viewers:

1. 190 degree angle of view. Provide rotating metal cover to match viewer at guestrooms.
2. Products:
a. Avendra, LLC Preferred Manufacturers:
1) None
b. Basis-of-Design Product: Subject to compliance with requirements, provide Door Viewers listed in hardware sets by Rockwood Manufacturing Co., An ASSA ABLOY Group Company, or comparable product by one of the following:
1) "Model DT101589"; Tell Manufacturing, Inc.
2) No Substitutions

R. Door Guards: Provide all guest room entry door guards.

1. Products:

a. Avendra, LLC Preferred Manufacturers:
   1) None
b. Basis-of-Design Product: Subject to compliance with requirements, provide Door Guards listed in hardware sets by Rockwood Manufacturing Co., An ASSA ABLOY Group Company or comparable product by one of the following:
   1) Pemko Manufacturing Company, an ASSA ABLOY Group Company

S. Thresholds:
1. At all doors usable by the handicapped thresholds shall not exceed 1/2" in height above finished floor with a maximum slope of 1:2 in accordance with ADA, and shall be in accordance with ANSI/BHMA 156.21.
2. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Door Thresholds listed in hardware sets by Pemko Manufacturing Company, an ASSA ABLOY Group Company, or comparable product by one of the following:
      1) National Guard Products, Inc. (NGP)
      2) Hager Companies

T. Weatherstrip, Sound Seals, Door Sweeps and Astragals.
1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide weatherstrip, sound seals, door sweeps and astragals listed in hardware sets by Pemko Manufacturing Company, an ASSA ABLOY Group Company, or comparable product by one of the following:
      1) National Guard Products, Inc. (NGP)

U. Protective Plates and Trim: Materials: Protection plates conforming to ANSI/BHMA 156.6, .050 minimum thickness, beveled edges (B4E) four sides. Mount centered, flush with bottom of door. Screws: Phillips head sheet metal screws plated to match plate.
1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide Protective Plates and Trim listed in hardware sets by Trimco/BBW, or comparable product by one of the following:
      1) Ives, an Allegion Brand
      2) Rockwood Manufacturing Co., An ASSA ABLOY Group Company
      3) Hager Companies

V. Silencers for Metal Door Frames: ANSI/BHMA 156.16 Grade 1; neoprene or rubber, minimum diameter 1/2-inch; fabricated for drilled application to frame.

W. Safety Device: For operable patio doors, provide stops to prevent opening greater than 4". Stops shall be constructed of stock window frame, or durometer material and attached with tamper-resistant screw.
   a. Avendra, LLC Preferred Manufacturers:
      1) None
   b. Basis-of-Design Product: Subject to compliance with requirements, provide "Charlie-Bar" security device by Charles Bar-Lok Corp.
      1) No Substitutions
   c. Size to fit door opening.

X. Key Control Box:
1. Products:
   a. Avendra, LLC Preferred Manufacturers:
      1) None

b. Basis-of-Design Product: Subject to compliance with requirements, provide Model "Regent RWC Series" by Telkee, Inc.
1) No Substitutions
2. Wall mounted lockable key cabinet complying with ANSI/BHMA A156.5.
3. Size: Sized for actual quantities of keys, plus 25%, plus additional capacity for 12 housekeeper pouches.
4. One wall mounted lockable key cabinet for four (4) key rings.
5. One key control log book.
6. Provide two (2) sets of color coded and numbered tags for key ring identification.

2.04 CYLINDERS AND KEYING

A. Hotel System-Permanent Keying:
1. Products:
a. Avendra, LLC Preferred Manufacturers:
1) None
b. Basis-of-Design Product: Subject to compliance with requirements, provide Cylinder Model "VA" by Sargent Manufacturing Co., An ASSA ABLOY Group Company, or comparable product by one of the following:
1) "1345"; Schlage Electronics, an Allegion Brand
2. All locksets shall have manufacturer's restricted keyway, reserved for Owner's use only.
3. All locksets shall be construction masterkeyed.
4. Owner will provide keying requirements for hotel system.
5. Locksets and cylinders shall contain 6-pin tumblers.
6. Furnish the following quantities of keys:
a. Grandmaster Keys (GMK) 10 each
b. Master Keys (each MK set) 5 each
c. Change Keys per lock 3 each
d. Keyed alike sets (each set) 4 each
e. Removable core control keys 4 each
7. Hotel System-Master Keying: Coordinate with Owner based upon the following general requirements.
a. Administrative Master Key "AA" - Operates all locks in the administrative and office areas of the hotel.
b. Engineering Master Key "AB" - Operates all locks in the engineering and maintenance areas, (i.e., engineer's office, entire maintenance section, mechanical and electrical rooms, utility closets, janitors closets, and all exterior doors, including the roof).
c. Food and Beverage Master Key "AC" - Operates all locks under the direct supervision of the steward, (i.e. kitchen, banquet rooms, food storage rooms, dining rooms and kitchen offices).
d. Housekeeping Master Key "AD" - Operates all locks under the direct supervision of the housekeeper, (i.e., housekeeper's office, pantries, linen rooms and linen chutes on guest floors and laundry room area).
e. Health and Exercise Master Key "AE" - Operates all locks in the health/exercise areas, (i.e., swimming pool, exercise room, pool lockers and game room).
f. Grand Master Key "A" – Operates locks as noted in paragraphs a through e above. Upon authorization of the Owner, keyblanks shall be sold only by direct main from the door lock manufacturer.
g. Keyed alike in sets, each set different.
1) Electrical and telephone closets.
2) Two or more doors to or from the same room area or space.
3) Public meeting room doors in accordance to areas subdivided by operable partitions.
4) Linen rooms and chute area doors.

B. Hotel System - Temporary Construction Keying:
1. Furnish temporary construction keying for use during construction. Prior to Owner occupancy of the building, the General Contractor with the Owner's Representative shall void out the construction keys.
2. Furnish 25 Construction Master Keys.

2.05 MISCELLANEOUS REQUIREMENTS

A. The hardware shall be the proper kind for its required use and shall fit its intended location. Should any hardware, as specified, fail to meet the intended requirements or require modification to suit the intended location, this matter, or any other necessary advance information, shall be brought to the attention of the [Architect] [Owner's Representative] for correction or decision in ample time to avoid delay in the manufacture and delivery of hardware.

B. The finish hardware listed herein shall not be construed as necessarily being a complete hardware schedule, but shall be considered as an indication of the hardware requirements desired by the Architect. It shall be the Contractor's responsibility to examine the Drawings and door schedules and provide all necessary or additional hardware as required but not scheduled herein. Such items of hardware shall be of the same type, quality, and quantity as that scheduled for similar doors or similar purposes.

C. In the accompanying hardware list, catalog numbers used are those of specific manufacturers, used to establish a minimum standard of quality and requirements as to type, weight, mechanical construction and operation to which hardware shall conform. That list indicates manufacturers on which catalog numbers are based, as well as acceptable equivalent manufacturers.

D. Proposals shall be based on specified (base or acceptable equivalent) brands. If the Contractor wishes to submit other brands as equivalent to those specified, they shall enter such proposed substitutions separately from their basic proposal. For each item proposed, they shall enter the amount to be added to or deducted from his base bid in the event the proposed substitution is accepted by the Owner's representative. Substitute items shall not be used without the approval of Marriott International.

E. Finish:

1. All hardware items not otherwise scheduled shall have the following finish:
   a. Refer to Hardware Sets in Hardware Schedule
2. Finish and Base Material Designations: Numbers indicate ANSI/BHMA A156.18 Finish Standards, or nearest traditional U.S. Commercial Finish Standards, or manufacturer's finish designation.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that doors and frames are ready to receive work and dimensions, are as indicated on Shop Drawings, and as instructed by the manufacturer.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install each hardware item in compliance with manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finished, reinstall each item. Do not install surface-mounted items until finishes have been completed on the substrate.

B. Conform to [ANSI ICC A117.1-2009] for positioning requirements for the Disabled.

C. All door closers shall be installed out of public sight wherever possible.

3.03 FASTENINGS

A. Suitable size, quantity, and material with finish to match the hardware.

B. Machine screws for attaching hardware to metal.

C. Self-tapping screws for attaching kickplate to hollow metal or wood mineral core doors.

D. Full thread type screws for attaching butt hinges to wood or mineral core doors.

E. Sex bolts and sleeves for attaching surface closers or arm to mineral core doors.

F. Non-ferrous or corrosion resistant steel fasteners for items exposed to weather.

3.04 HARDWARE LOCATIONS

A. Hardware mounting heights shall conform to the following unless otherwise indicated on the drawings.

1.	Hinges:	Top - 5" from head to top of hinge leaf. Bottom - 10" from bottom of hinge to finished floor. Intermediates. Intermediates - Equal distance between top and bottom hinges (Maximum 3'-0")
2.	Card Readers:	40" from finish floor to centerline
3.	Locks/Latches:	38" from finish floor to center of lock/latch.
4.	Deadlocks/Deadbolts:	48" from finished floor to center of cylinder.
5.	Door Guards:	60" from finished floor to center line. At Accessible Guest Rooms maximum 48" from finished floor to center line.
6.	Door Viewer:	57" from finished floor to center line. At Accessible Guest Rooms, provide two door viewers with mounting heights at 45" and 57" from finish floor to centerline.
7.	Doorpulls, Pushplates Pushbars:	45" from finish floor to centerline.
8.	Exit Device Crossbars:	38" from finish floor to center of crossbar.
9.	Electromagnetic Hold-Open:	Set wall mounted type 72" from finish floor to centerline. Wall mounted templates shall be issued by hardware supplier.

3.05 HARDWARE INSTALLATION

A. Coordination:

1. Fit and adjust hardware in accordance with manufacturer's packaged instructions.
2. Coordinate installation with all trades, millwork, finish hardware, door frames and electrical.

B. Sound and Smoke Seals:

1. Install adhesive seals per manufacturer's instructions. Pre-cut pieces to fit before installing. Do not install as one continuous piece. Install jamb pieces first and header piece last. Position jamb pieces on the door frame rabbet 1/16" from the header rabbet to allow for header piece clearance. Install header piece on the header rabbet with ends overlapping and fitting above jamb piece.
2. Install adhesive seals on astragal of double doors.

C. Door Viewers: 190 degree viewers with covers at Guest Room doors. 190 degree extra wide angle view at ballroom and meeting room doors.

D. Door Guards: Guest Room entry door guards shall have strike plate furnished standard with door guard.

3.06 ADJUSTING

A. Adjustments:

1. Weatherstripping and sound/smoke seals shall not interfere with operation of doors and shall be adjusted accordingly.
2. Secure door bottom in strict accordance with manufacturer's printed instructions and as required to seal door to threshold.
3. Door seals to provide intended functions. Replace seals which do not perform.
4. Adjust door so that lockset can be easily opened with a key/card key without binding between the latchbolt and strike. Doors too tight (or too loose) will not be accepted.
5. Clearances between door and frame, at jambs and head: No greater than 1/8" +/- 1/16".
6. Prior to Owner's "soft opening" replace Guest Room battery power supply units with new alkaline batteries.

3.07 PROTECTION

A. Reinstall wrappings furnished by manufacturer for protecting items such as levers, handles and pulls.

B. Do not remove manufacturer's protective covering of flat items such as kickplates and push plates until just prior to final acceptance of the building.

3.08 CLEANING

A. After installation, clean metal surfaces on both interior and exterior of all mortar, plaster, paint and other contaminants. After cleaning, protect work against damage.

3.09 FINAL ADJUSTMENT

A. Whenever hardware is installed more than one month prior to acceptance or occupancy of a space or area, return during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area.

B. At the completion of the project, manufacturers' suppliers or representatives shall inspect their hardware and make any corrections required due to errors or improper installation.

PART 4 HARDWARE SCHEDULE

4.01 HW SET - T1 GUEST ENTRY

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	LOCK	QUANTUM RFID X ADB X BLE X CONTINENTAL	US26D	SAF
1 EA	CLOSER	2701	689	YAL
1 EA	DOOR GUARD	607 PDL	US26D	RO
1 EA	DOOR VIEWER	627 (WITH HINGED COVER)	US26D	RO
1 EA	WALL STOP	1270WVCP	US26D	TRM
1 SET	DOOR SEALS	S773D		PEM
1 EA	AUTO DOOR BOT	PDB411AE	US27	PEM
1 EA	MAG SWITCH	REFER TO SECTION 25 51 10		

NOTE: AT LOCKOUT DOORS ONLY: PROVIDE FUNCTION THAT ALLOWS DOOR TO BE UNLOCKED AT ALL TIMES BY CODING RFID CARD. USING INSIDE DEADBOLT OVERIDES AND LOCKS DOOR.

4.02 HW SET - T1A ACCESSIBLE GUEST ENTRY

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	LOCK	QUANTUM RFID X ADB X BLE X CONTINENTAL	US26D	SAF
1 EA	CLOSER	2701	689	YAL
1 EA	DOOR GUARD	607 PDL	US26D	RO
2 EA	DOOR VIEWER	627 (WITH HINGED COVER)	US26D	RO
1 EA	WALL STOP	1270WVCP	US26D	TRM
1 SET	DOOR SEALS	S773D		PEM
1 EA	AUTO DOOR BOT	PDB411AE	US27	PEM
1 EA	MAG SWITCH	REFER TO SECTION 25 51 10		

NOTE: AT LOCKOUT DOORS ONLY: PROVIDE FUNCTION THAT ALLOWS DOOR TO BE UNLOCKED AT ALL TIMES BY CODING RFID CARD. USING INSIDE DEADBOLT OVERIDES AND LOCKS DOOR.

4.03 HW SET - T2 GUEST BATH

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	T2714 4.5 X 4.5	US26D	MCK
1 EA	PRIVACY SET	28-65U65 KP	US26D	SAR
1 EA	WALL STOP	WS11/WS11X	US26D	IVES
3 EA	SILENCERS	1229A		TRM

4.04 HW SET - T2A ACCESSIBLE GUEST BATH (OUTSWING)

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	T2714 4.5 X 4.5	US26D	MCK
1 EA	PRIVACY SET	28-65U65 KP	US26D	SAR

1 EA	WALL STOP	1270 WVCP	US26D	TRM
3 EA	SILENCERS	1229A		TRM

4.05 HW SET - T3 GUEST (SUITE) BEDROOM

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	T2714 4.5	US26D	MCK
1 EA	PRIVACY SET	28-65U65 KP	US26D	SAR
1 EA	WALL STOP	1270WVCP	US26D	TRM
3 EA	SILENCERS	1229A		TRM

4.06 HW SET - T4B GUEST CLOSET

MIRRORED DOORS
EACH DOOR TO HAVE:
NOTE: DOOR HARDWARE BY DOOR MANUFACTURER (REFER SECTION 08 11 13)

4.07 HW SET - T5 COMMUNICATING DOORS

COMMUNICATING PAIR DOORS
EACH DOOR TO HAVE:

2 EA	SPRING HINGES	1502 4.5 X 4.5	US26D	MCK
1 EA	HINGE	TA2714 4.5 X 4.5	US26D	MCK
1 EA	COMMUNICATING LOCKSET	28-65G15-3-KP	US26D	SAR
1 EA	DEADBOLT	489	US26D	SAR
1 EA	WALL STOP	1270WVCP	US26D	TRM
1 EA	AUTO DOOR BOT	PDB411AE	US27	PEM
1 SET	DOOR SEALS	S773D		PEM

4.08 HW SET - T10 INTERIOR STAIRS

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	PASSAGE SET	28-10U15 LP	US26D	SAR
1 EA	CLOSER	2701	689	YAL
1 EA	FLOOR STOP	1231	US26D	TRM
1 EA	WALL MAGNET	FM998	689	RIX
1 SET	DOOR SEALS	S773D		PEM

NOTE: WALL MAGNET TO BE TIED INTO FIRE ALARM SYSTEM.

4.09 HW SET - T11 EXTERIOR STAIRS

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2314 4.5 X 4.5 NRP	US26D	MCK
1 EA	EXIT DEVICE	99EO-F	US26D	VDI
1 EA	CLOSER	2721	689	YAL
1 EA	THRESHOLD	172A	US27	PEM
1 EA	DOOR SWEEP	315AN	US27	PEM
1 SET	DOOR SEALS	S773D		PEM

4.10 HW SET - T11A EXTERIOR STAIRS AT ROOF

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2314 4.5 X 4.5 NRP	US26D	MCK
1 EA	LOCKSET	76-28-10G37 LP	US26D	SAR
1 EA	CLOSER	2721	689	YAL

1 EA	THRESHOLD	172A	US27	PEM
1 EA	DOOR SWEEP	315AN	US27	PEM
1 SET	DOOR SEALS	S773D		PEM

NOTE: DOOR LOCKED FROM STAIR SIDE, ALWAYS UNLOCKED FROM ROOF SIDE

4.11 HW SET - T12 CORRIDOR TO EXTERIOR /

SINGLE DOORS
EACH DOOR TO HAVE:

1 EA	OH CONCEALED CLOSER	0608090N X LCP	US26D	RIX
1 EA	ELEC EXIT DEV.	EL33NL-OP	US26D	VDI
1 EA	CYLINDER	34	US26D	SAR
1 EA	FLOOR STOP	1233	U26D	TRM
1 EA	ELEC POWER TRANSFER	EPT10		VDI
1 EA	POWER SUPPLY	PS914		VDI
1 EA	RFID REMOTE READER	RCU RFID X BLE	US32D	SAF

NOTE: CONTINUOUS HINGES, PULLS, THRESHOLD & DOOR SEALS BY DOOR SUPPLIER.

4.12 HW SET - T12C LOUNGE TO EXTERIOR / CORRIDOR TO EXTERIOR

PAIR DOORS
EACH PAIR TO HAVE:

2 EA	OH CONCEALED CLOSER	0608090N X LCP	US26D	RIX
2 EA	ELEC EXIT DEV.	EL33NL-OP	US26D	VDI
2 EA	CYLINDER	34	US26D	SAR
2 EA	FLOOR STOP	1233	U26D	TRM
1 EA	ELEC POWER TRANSFER	EPT10		VDI
1 EA	POWER SUPPLY	PS914		VDI
1 EA	RFID REMOTE READER	RCU RFID X BLE	US32D	SAF

NOTE: CONTINUOUS HINGES, PULLS, THRESHOLD & DOOR SEALS FURNISHED BY DOOR SUPPLIER.

4.13 HW SET - T13 EXTERIOR MEETING, (EXTERIOR) COLLABORATION AREA

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2314 4.5 X 4.5 NRP	US26D	MCK
1 EA	OH CONCEALED CLOSER	0608090N X LCP	US26D	RIX
1 EA	EXIT DEVICE	CD33EO	US26D	VDI
1 EA	CYLINDER	42	US26D	SAR
1 EA	THRESHOLD	172A	US27	PEM
1 EA	DOOR SWEEP	315AN	US27	PEM
1 SET	DOOR SEALS	S773D		PEM
1 EA	FLOOR STOP	1233	US26D	TRM

NOTE: COORDINATE WITH VISION CONTROL GLASS PER SECTION 08 80 00.

4.14 HW SET - T14 EXTERIOR FITNESS ROOM

SINGLE DOORS
EACH DOOR TO HAVE:

1 EA	OH CONCEALED CLOSER	0608090N X LCP	US26D	RIX

1 EA	ELEC EXIT DEV.	EL33NL-OP	US26D	VDI
1 EA	CYLINDER	34	US26D	SAR
1 EA	FLOOR STOP	1233	US26D	TRM
1 EA	ELEC POWER TRANSFER	EPT10		VDI
1 EA	POWER SUPPLY	PS914		VDI
1 EA	RFID REMOTE READER	RCU RFID X BLE	US32D	SAF

NOTE: CONTINUOUS HINGES, PULLS, THRESHOLD & DOOR SEALS FURNISHED BY DOOR SUPPLIER.

4.15 HW SET - T14C INTERIOR FITNESS ROOM / GUEST LAUNDRY

SINGLE DOORS
EACH DOOR TO HAVE:

1 EA	OH CONCEALED CLOSER	0608090N X LCP	US26D	RIX
1 EA	ELECTRO. LOCK	M390RFK	US26D	SCE
1 EA	DOOR SENSOR	SCAN II	US26D	PUL
1 EA	POWER SUPPLY	PS902		VDI
1 EA	RFID REMOTE READER	RCU RFID X BLE	US32D	SAF
1 EA	PUSH BUTTON	701RDEX		SCE

NOTE: CONTINUOUS HINGES, PUSH/PULLS, THRESHOLD & DOOR SEALS BY DOOR SUPPLIER.

4.16 HW SET - T15 EXTERIOR VESTIBULE ENTRY (AUTOMATIC SLIDING DOORS)

PAIR DOORS
EACH PAIR TO HAVE:

1 EA	PUSH BUTTON RELEASE	MUSHROOM BUTTON 32310		SAF
1 EA	KEYSWITCH	653-04	US26D	SCE
1 EA	CYLINDER	41 (@ KEYSWITCH)	US26D	SAR
1 EA	RFID REMOTE CONTROL UNIT	FLUSH MTD. 94770 RFID X BLE		SAF
1 EA	POWER SUPPLY	32280		SAF
1 EA	AIPHONE INTERCOM SYSTEM	LEM-1 DLS		AIP

NOTE: AUTOMATIC DOOR HARDWARE & ACCESSORIES BY DOOR MANUFACTURER

4.17 HW SET - T15A INTERIOR VESTIBULE ENTRY (AUTOMATIC SLIDING DOORS)

PAIR DOORS
EACH PAIR TO HAVE:

1 EA	PUSH BUTTON RELEASE	MUSHROOM BUTTON 32310		SAF
1 EA	KEYSWITCH	653-04	US26D	SCE
1 EA	CYLINDER	41 (@ KEYSWITCH)	US26D	SAR
1 EA	RFID REMOTE CONTROL UNIT	FLUSH MTD. 94770 RFID X BLE		SAF
1 EA	POWER SUPPLY	32280		SAF
1 EA	AIPHONE INTERCOM SYSTEM	LEM-1 DLS		AIP

NOTE: AUTOMATIC DOOR HARDWARE & ACCESSORIES BY DOOR MANUFACTURER

4.18 HW SET - T16 ENGINEERING OFFICE / LINEN CHUTE DISCHARGE / ELECTRICAL / MECHANICAL / LINEN / LAUNDRY WORKROOM / KITCHEN STORAGE

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	LOCKSET	QUANTUM RFID X BLE (LESS DEADBOLT) X CONTINENTAL	US26D	SAF
1 EA	CLOSER	2701	689	YAL
1 EA	WALL STOP	1270WVCP	US26D	TRM
1 SET	DOOR SEALS	S773D		PEM

NOTE: HANDICAP WARNING ONLY ON MECHANICAL/ELECTRICAL ROOMS

4.19 HW SET - T16A EXTERIOR MECHANICAL

PAIR DOORS
EACH PAIR TO HAVE:

6 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
2 EA	FLUSH BOLTS	3917	US26D	TRM
1 EA	DUST PROOF STRIKE	3910	US26D	TRM
1 EA	LATCHGUARD			
1 EA	LOCKSET	76-28-10G04 LP	US26D	SAR
1 EA	CLOSER	2701 (ACTIVE LEAF)	689	YAL
2 EA	WALL STOPS	1270WVCP	US26D	TRM
1 SET	ASTRAGAL	S772		PEM
1 EA	THRESHOLD	172A	US27	PEM
1=2 EA	DOOR SWEEP	315CN	US28	P
2 SET	DOOR SEALS	S773D		PEM

NOTE: HANDICAP WARNING

4.20 HW SET - T17 STORAGE

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	PASSAGE SET	28-10U15 LP	US26D	SAR
1 EA	WALL STOP	1270WVCP	US26D	TRM
3 EA	SILENCERS	1229A	US27	PEM

4.21 HW SET - T18 EXTERIOR

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	ELEC EXIT DEV.	EL33NL-OP	US26D	VDI
1 EA	CYLINDER	34	US26D	SAR
1 EA	FLOOR STOP	1233	US26D	TRM
1 EA	ELEC POWER TRANSFER	EPT10		VDI
1 EA	POWER SUPPLY	PS914		VDI
1 EA	RFID REMOTE READER	RCU RFID X BLE	US32D	SAF
1 EA	CLOSER	2701	689	YAL

4.22 HW SET - T20 MEETING

PAIR DOORS
EACH PAIR TO HAVE:

6 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
2 EA	EXIT DEVICES	9927L X 17 LEVER	US26D	VDI

2 EA	CYLINDERS	34	US26D	SAR
2 EA	CLOSER	2711	689	YAL
1 EA	DOOR VIEWER	U696B	US26D	IVES
2 EA	FLOOR STOPS	1231	US26D	TRM
2 SET	DOOR SEALS	S773D		PEM

NOTE: DOOR CLOSER TO BE ADJUSTABLE BY LEAF

NOTE: DOOR VIEWER TO VIEW INTO ROOM FROM CORRIDOR

4.23 HW SET - T23 MEN / WOMEN

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26	MCK
1 EA	PUSH/PULL	1001-3 / 1013-3B	US26	TRM
1 EA	DEADBOLT	484	US26	SAR
1 EA	CLOSER	2701	689	YAL
1 EA	KICKPLATE	K0050 8” X 2” LDW	US26	TRM
1 EA	WALL STOP	1270WVCP	US26	TRM
1 SET	DOOR SEALS	S773D		PEM

4.24 HW SET - T26 WORK ROOM

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	LOCK	QUANTUM RFID X BLE (LESS DEADBOLT) X CONTINENTAL	US26D	SAF
1 EA	CLOSER	2701	689	YAL
1 EA	WALL STOP	1270WVCP	US26D	TRM
3 EA	SILENCERS	1229A	US27	PEM

4.25 HW SET - T27 LAUNDRY FROM CHUTE

PAIR DOORS
EACH PAIR TO HAVE:

6 EA	HINGES	T4A3786 4.5 X 4.5	US26D	MCK
2 EA	FLUSH BOLTS	3917	US26D	TRM
1 EA	DUST PROOF STRIKE	3910	US26D	TRM
1 EA	PASSAGE SET	28-10U15 LP	US26D	SAR
1 EA	CLOSER	2701 (ACTIVE LEAF)	689	YAL
1 EA	KICKPLATE	K0050 8” x 2” LDW (ACT LEAF)	US26D	TRM
1 EA	WALL STOP	1270WVCP (ACTIVE LEAF)	US26D	TRM
2 EA	WALL MAGNET	FM998	689	RIX
2 SET	DOOR SEALS	S773D		PEM

NOTE: WALL MAGNET TO BE TIED INTO FIRE ALARM SYSTEM.

4.26 HW SET - T28 EMPLOYEE BREAK ROOM

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	LOCK	QUANTUM RFID X BLE (LESS DEADBOLT) X CONTINENTAL	US26D	SAF
1 EA	CLOSER	2701	689	YAL
1 EA	WALL STOP	1270WVCP	US26D	TRM
3 EA	SILENCERS	1229A		PEM

4.27 HW SET - T29 EMPLOYEE RESTROOM

SINGLE DOORS

EACH DOOR TO HAVE:

3 EA	HINGES	TA2314 4.5 X 4.5	US26D	MCK
1 EA	PRIVACY SET	28-10U65 LP	US26D	SAR
1 EA	CLOSER	2521	689	YAL
3 EA	SILENCERS	1229A		TRM

4.28 HW SET - T30 OFFICES / LUGGAGE/ WORKROOM CLOSET/ TELECOM

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	T2714 4.5 X 4.5	US26D	MCK
1 EA	LOCKSET	28-10G05 LP	US26D	SAR
1 EA	WALL STOP	1270WVCP	US26D	TRM
3 EA	SILENCERS	1229A		TRM

4.29 HW SET – T31A KITCHEN

SINGLE DOOR
PROVIDE DOUBLE ACTING FRAME – SIZE DOOR TO ACCOMMODATE DOUBLE ACTING SWING
EACH DOOR TO HAVE:

3 EA	SPRING HINGES	1001 4”	US26D	MCK
1 EA	DEADBOLT	485	US26D	SAR
2 EA	PUSH	1001-3	US26D	TRM
2 EA	WALL STOP	1270WVCP	US26D	TRM
2 EA	KICKPLATE	K0050 18” x 2” LDW	US26D	TRM

4.30 HW SET - T32 MEETING CLOSETS

PAIR OF DOORS
EACH LEAF TO HAVE:

3 EA	HINGES	T2714 4.5 X 4.5	US26D	MCK
1 EA	PULL	1013-3B	US26D	TRM
1 EA	ROLLER LATCH	RL1152	US26D	IVES
1 EA	SILENCERS	1229A		TRM

4.31 HW SET - T35 DRYERS

SINGLE DOORS
EACH DOOR TO HAVE:

3 EA	HINGES	TA2714 4.5 X 4.5	US26D	MCK
1 EA	PASSAGE SET	28-10U15 LP	US26D	SAR
1 EA	CLOSER	2701	689	YAL
1 EA	WALL STOP	1270WVCP	US26D	TRM
3 EA	SILENCERS	1229A		TRM

4.32 HW SET – T50 COLLABORATION AREA (INTERIOR)

SLIDING DOORS 27
NOTE: ALL HARDWARE BY DOOR MANUFACTURER

END OF SECTION

SECTION 08 75 16

WINDOW OPERATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Actuators with hand crank and other features which enable window system to operate within ADAAG, UFAS, and ANSI A117.1 standards. Actuator device to operate vertical or horizontal sliding windows.

B. Related Sections:

1. Section 08 11 13 – Aluminum Windows
2. Section 08 54 13 – Fiberglass Windows
3. Section 08 54 13.03 – Fiberglass Windows – High Performance

1.02 REFERENCES

A. Perform all work in accordance with the following:

1. American National Standards Institute (ANSI) Publications:
   a. ICC A117.1-2009 "Accessible and Useable Buildings and Facilities"
2. National Fire Protection Association (NFPA) Publications:
   a. 101 "Life Safety Code"

B. Regulatory Requirements:

1. Conform to requirements of [ANSI ICC A117.1-2009]
2. Accessibility: Hardware for windows used by the disabled shall comply with all state and local codes which shall supersede this Section. Notify the Owner's Representative of conflicts between regulations and this specification prior to providing hardware.
   a. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

1.03 PERFORMANCE REQUIREMENTS

A. Window actuating system to be compatible with type and model of window to be modified.

B. Window actuating system to open, close and latch windows within referenced standards and codes.

C. Window actuator system to be self-adjusting and essentially maintenance free.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Submit Shop Drawings and product data that include wall opening and component dimensions;; anchorage and fasteners; affected related work; indicating non-standard layout and placement of actuator, and installation requirements and instructions.
   a. Provide samples of materials as may be requested without cost to Owner, i.e., metal, glass, fasteners, anchors, frame sections, mullion section, etc.
   b. Copy of warranty.
2. Coordination Drawings
   a. Scaled or dimensioned window construction drawings (sections) from manufacturer of window.
   b. Actual field conditions of installed window, on forms provided by manufacturer, which define: jamb depth, window/jamb/head/mullion(s) dimensions and configurations,

verification of movable sash attachment area, distance between jambs, distance between head and finished sill, and distance from finished floor to finished sill.

c. Indicate preferred control location - right or left handed, and height of sill above finished floor.

d. Window Manufacturer shall approve Shop Drawings in writing to insure proper product application.

1.05 QUALITY ASSURANCE

A. All actuators shall be manufactured by a single source.

B. Compatibility and Location Requirements

1. Ensure compatibility of actuator with window provided by others.
2. Window shall be mounted with consideration for actuator control location (refer to ANSI A117.1 for reach requirements). Adjoining walls, cabinets, furniture, and other reach obstructions must be considered.

C. Coordinate with submittals for Window Units to ensure compatibility of actuator with intended window units. For standard window actuator, windows to be modified must be in accordance with the following:

1. Be a maximum size of [40-inches by 60-inches for hung windows] [60-inches by 40-inches for sliders] with a maximum ever opening force of 35 lbf.. Minimum size of [30-inches for hung windows] [30-inches for sliders].
2. Have clear area on moveable sash stiles (or rails if slider) to receive tapping screws, for actuator attachment. Clear attachment area to be a minimum of 7/16" between glazing edge (usually pocketed in stile of moveable sash) and window channel/track.
3. If double-hung, the upper sash must be immobilized (fixed).
4. Allow for standard** Window Ease™ window actuator operating and installation parameters which:
5. Allow a maximum jamb/sill depth of 5 1/2" (**without extensions).
6. Locates center of controls 6" or less from face of window into room** and a minimum of 4" up from the top of sill.
7. Verify clear operation radius of from the controls center with window manufacturer.
8. Verify minimum jamb depth required to fully recess actuator covers into window opening with window manufacturer.
9. Allow for maximum dimensions for handles or other protrusions from face of moveable sash as verified with window manufacturer.
10. If required, provide for Optional crank or controls extension(s) as well as other hardware for accommodating non-standard conditions such as oversize windows, ganged windows, deep jambs or sills, shallow jambs due to retrofit panning, windows which adjoin cabinets, or similar conditions.

D. Mockups: Build mockups to set quality standard for fabrication and installation.

1. Install actuator on one window unit to demonstrate compatibility and functional operation.
2. Install on a window unit that can easily be inspected from both sides.
3. Prepare and test field sample prior to installation of operators on windows installed in building.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Inspection: General Contractor shall provide in writing to Owner's Representative] an inspection of all accessible window units for conformance to specifications. Inspection shall include checking for fit tolerance plumb and level as well as proper hardware and operation.

1.06 SEQUENCING

A. Sequence installation of window actuator after completion of finishes surrounding window, and after final cleaning and adjustments have been made to window.

1.07 WARRANTY

A. Furnish a written guarantee which shall cover the periods stated below from and after the completion of the building and its acceptance by the Owner.

B. Warranty to cover system installation and all components required to actuate windows. In event of failure, warranty shall provide for replacement parts, removal, installation, and repair.

C. For a period of one (1) year after final acceptance by the Owner. Hardware failing to comply with warranty shall be removed and replaced with new material including labor at no cost to Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Window Units

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

2.02 MANUFACTURES

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. “Window Ease Window Actuator”; Southwest Home Products LLC, (505-856-6632)

a. Manual Hand Operation

2. Approved Substitution by Marriott International.

2.03 WINDOW ACTUATOR

A. Technical features:

1. Actuator maintains inherent operating range of window.
2. All actuator control functions from one location.
3. Internal balance mechanism to ensure tight weather gasket closure.
4. Emergency escape and rescue opening requirement in eight crank revolutions or less.
5. Synchronous two sided pull for jam resistant operation.
6. Clutching or power disengagement capability shall prevent damage to window or window actuator due to occasional excessive operational force.
7. "Free wheeling" emergency egress feature to ensure compliance with Life Safety Code 101.
8. Latching feature capable of infinite number of latched open window positions.
9. Actuator shall not require routine maintenance and shall essentially be self adjusting and maintenance free.

B. Materials:

1. All parts to be corrosion resistant.

2. Bearings: Self lubricating ball bearings.

C. Accessories:

1. Special Cover finishes available: Special powder coating, high solid paint, anodized available. Standard covers are powder coated bronze or white. Standard cover corners and controls are black.
2. Cover Finish: Match window color, as approved by Owner’s Representative
3. Side cover closures for surface (wall) mounting, shallow jamb mounting or center ganged or mulled window trim.
4. Special mounting hardware for ganged or mulled window.
5. Oversize window kit.
6. Heavy duty drive for windows over 35lbs and up to 55lbs operating force.
7. Alternative crank handles.
8. Custom (non-standard) sash or chassis brackets and adapters.
9. Crank or latch control extension(s) kits.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installer shall have experience installing devices of the type specified.

B. Preparation: Examine installed windows and determine that installation is complete and that windows are operating smoothly and compatible with all actuator system requirements.

C. Install actuators according to manufacturer's recommended instructions and approved shop drawings.

3.02 FIELD QUALITY CONTROL

A. After installation, test all windows and operators. Cycle open and closed a minimum of ten times. Verify:

1. Proper sash alignment in window frame.
2. Full opening and closing.
3. Latching system operation.
4. "Excessive force" clutching system.
5. Emergency "free wheeling" function.
6. Complete and tight gasket closure for weather tight window unit seal.

B. Correct deficiencies and make required actuator adjustments.

3.03 DEMONSTRATION

A. Demonstrate operation of window operator(s) to Owner's designated representative(s).

3.04 ADJUSTING AND CLEANING

A. After completion of window installation, windows shall be inspected, adjusted, put into working order and left clean, free of labels, dirt, etc. Protection from this point shall be responsibility of General Contractor.

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Doors.
   2. Glazed entrances.
   3. Interior borrowed lites.
   4. Storefront framing.

B. Glazing for Aluminum windows is specified in Section 085113 “Aluminum Windows”

1.2 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
      a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures":

Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

1) Basic Wind Speed: Per applicable IBC with state amendments.
2) Importance Factor: I.
3) Exposure Category: B.

b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
   1) Load Duration: 60 seconds or less.
c. Probability of Breakage for Sloped Glazing: 1 lite per 1000 for lites set more than 15 degrees off vertical and under wind and snow action.
   1) Load Duration: 30 days.
d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass.

C. Glazing Schedule: Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer.

1.5 QUALITY ASSURANCE

A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: GANA's "Glazing Manual."
   2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

C. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

D. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F (250 deg C), and the fire-resistance rating in minutes.

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

C. Reflective-Coated Spandrel Glass: ASTM C 1376, Kind CS; coated by pyrolytic process, and complying with other requirements specified.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Viracon, Solar screen or comparable product by one of the following:
    a. Old Castle Glass.
    b. PPG Architectural Glass
2. See building elevation drawings for specifications.

2.3 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

B. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, with "Windborne-Debris-Impact Resistance" Paragraph in "Glass Products, General" Article, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Construction: Laminate glass with the following to comply with interlayer manufacturer's written recommendations:
    a. Polyvinyl butyral interlayer.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.4 INSULATING GLASS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Viracon.
2. Old Castle Glass.
3. PPG Architectural Glass.

B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Provide units as specified on building elevation drawings or equal from manufacturer noted.
2. Sealing System: Dual seal.
3. Spacer: Manufacturer's standard spacer material and construction.
4. Provide insulating units with same exterior appearance (color, reflectance) as units specified in Section 08 51 13 “Aluminum Windows”

C. Performance requirements
1. U-factor: no greater than 0.38
2. SHGC: no greater than 0.40
3. VT: 0.80

2.5 FIRE-PROTECTION-RATED GLAZING

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Film-Faced Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch (5-mm) nominal thickness; faced on one surface with a clear glazing film; complying with testing requirements in 16 CFR 1201 for Category II materials.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite NT.
      b. Safti First; SuperLite C/SP.
      c. Vetrotech Saint-Gobain; SGG Keralite FR-F.

C. Laminated Ceramic Glazing: Laminated glass made from 2 plies of clear, ceramic flat glass; 5/16-inch (8-mm) total nominal thickness; complying with testing requirements in 16 CFR 1201 for Category II materials.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); FireLite Plus.
      b. Schott North America, Inc.; Laminated Pyran Crystal.
      c. Vetrotech Saint-Gobain; SGG Keralite FR-L.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from the following:
   1. Neoprene complying with ASTM C 864.
   2. EPDM complying with ASTM C 864.
   3. Silicone complying with ASTM C 1115.
   4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

2.7 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
   4. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.

B. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.8 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

PART 3 - EXECUTION

3.1 GLAZING

A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
6. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
2. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
3. Apply heel bead of elastomeric sealant.

4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
5. Apply cap bead of elastomeric sealant over exposed edge of tape.

C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
3. Install gaskets so they protrude past face of glazing stops.

D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

SECTION 089000

LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed, formed-metal louvers.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

1. Wind Loads: Per current building codes and requirement of authorities having jurisdiction.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

C. Samples: For each type of metal finish required.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, G60 (Z180) G90 (Z275) zinc coating, mill phosphatized.

B. Fasteners: Use types and sizes to suit unit installation conditions.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, FORMED-METAL LOUVERS

A. Horizontal, Drainable-Blade Louver: Confirm with MEP Contractor that louver meets mechanical requirements.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Louver grilles as indicated on the drawings or comparable product by one of the following:
   a. Airolite Company, LLC (The).
   b. Construction Specialties, Inc.
   c. Ruskin Company; Tomkins PLC.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.

C. Louver Screening:
1. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire.

2.5 GALVANIZED-STEEL SHEET FINISHES

A. Finish louvers after assembly.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair according to ASTM A 780.

C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: custom color as indicated on the drawings to match adjacent wall color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather tight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION 089000

Courtyard - Exterior Finish Index - Gen 6.5

Revised: September 18, 2019

Note: All substitutions for colors, where allowed, are to be approved by Marriott.

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION	
09 54 23	Ceiling and Wall System	WD1	Loggia	Ceilings Plus	Pattern: Color:	4" Planks Planx/ Mirra - Sarante Sarante Natural Walnut S38 finish with UV coating
05 50 00	Decorative Metal Bollards		Main Entrance		Bollard: Color:	6" diameter galvanized schedule 40 steel pipe bollard with slanted top AAMA 2605 Dark Bronze Powder Coat to Match Windows
05 73 00	Aluminum Railings Pool				Color:	AAMA 2605 Dark Bronze Powder Coat to Match Windows
07 24 19	Exterior Insulation & Finish System	EF1	General Building Finish - Refer to Drawings	Control Color	Color:	Sherwin Williams "SW7666 Fleur de Sel"
				Dryvit	Color: Texture:	MACO 10 2737 - Provide "HDP" Hydrophobic Water/Dirt Repellant Performance Enhancement "Sandpebble"
				Master Wall Inc	Color: Texture:	CLR #14961 Sherwin Williams "SW7666 Fleur de Sel" - Provide Silicone Coat for Water / Dirt Repellant Performace Enhancement Medium Sand 1.5
				BASF	Color: Texture:	To match control color as approved by Owner's Representative Sahara
				Sto	Color: Texture:	To match control color as approved by Owner's Representative Medium Sand
				Parex USA	Color: Texture:	NAC 189601 Aquasol DPR Finsh Sand Course
		EF2	Window Accent - Refer to Drawings	Control Color	Color: Texture:	Sherwin Williams "SW6719 Gecko" or approved color by Marriott International Specialty coating with pearlescent appearance
				Dryvit	Color: Texture:	MACO 11 1087 "Reflectit" Metallic Finish over MACO 11 1094S (StratoTone High Performance Colorant) Metallic Coating over Lymestone
				Master Wall Inc	Color: Texture:	Sherwin Williams 6719 Gecko Metallic Cote over SW 6719 Aggrelime with Durotone Pigments or Metal Tex Aggrelime in SW 6719 Gecko over SW 6719 Aggrelime with Durotone Metallic Coating over Aggrelime or Metallic Aggrelime Finish
				BASF	Color: Texture:	To match control color as approved by Owner's Representative To match control texture as approved by Owner's Representative
				Sto	Color: Texture:	To match control color as approved by Owner's Representative To match control texture as approved by Owner's Representative

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION
07 24 19	Exterior Insulation & Finish System Cont.			Parex USA	Color: NAC M76768 Gecko Metallic Coating Texture: over Sand Smooth
07 24 19	Exterior Insulation & Finish System Reveal	RV1	Refer to Drawings	Provided by EIFS Manufacturer	Product: 3/4" PB Control Joint Color: To match EF1 Control Color
		RV2	Refer to Drawings	Provided by EIFS Manufacturer	Product: 1-1/4" Reveal Expansion Joint (Slip Joint) Color: To match EF1 Control Color
07 24 23	Direct Applied Exterior Finish Systems	EF3	Fences and Service Yard Enclosure - Refer to Drawings	Control Color	Color: To match SP1 as approved by Owner's Representative
				Dryvit	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				Master Wall Inc.	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				BASF	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				Sto	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				Parex USA	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
07 46 46	Fiber-Cement Board Siding & Soffits		Cement Board Soffits - Refer to Drawings	Control Color	Color: To match EF1 as approved by Owner's Representative
				Dryvit	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				Master Wall Inc.	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				BASF	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				Sto	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott
				Parex USA	Color: To match control color as approved by Owner's Representative Texture: As approved by Marriott

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION	
07 46 46	Fiber-Cement Siding Panels	SP1	Refer to Drawings	Rieder	Pattern: Size: Installation: Color: Texture:	Oko Skin Slat Wall Plank Panels 147 mm width x variable lengths Vertical installation - 1/3 shifted; Rivet fastening system with mitred corner conditions Anthracite (Where screws are exposed use color-matched screws SM Smooth
				Nichiha	Pattern: Installation: Color: Texture:	VintageWood Vertical installation; hidden "ultimate clip system" Bark: or custom color as approved by Marriott Representative Wood grain, or custom smooth.
07 42 13	Metal Wall & Ceiling Panels	MT3	Walls at Loggia and Canopies	PAC-CLAD	Product: Color:	20" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 Dark Bronze
				ATAS	Product: Color:	20" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 To match PAC-CLAD Dark Bronze
				Berridge	Product: Color:	20" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 To match PAC-CLAD Dark Bronze
				Dimensional Metals	Product: Color:	20" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 To match PAC-CLAD Dark Bronze
		MT4	Ceilings at Porte Cochere	PAC-CLAD	Product: Color:	12" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 Bone White
				ATAS	Product: Color:	12" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 To match PAC-CLAD Bone White
				Berridge	Product: Color:	12" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 To match PAC-CLAD Bone White
				Dimensiojnal Metals	Product: Color:	12" Wide Flush Seam Panels (no insulation) Smooth Standard Panels AMMA 2605 To match PAC-CLAD Bone White
	Metal Shadow Boxes at Windows	MT2	Refer to Drawings	PAC-CLAD	Product: Color:	Custom Fabricated Metal PPG #UC128109 (AMMA 2605) Duranar Bone White
				ATAS	Product: Color:	Custom Fabricated Metal PPG #UC128109 (AMMA 2605) Duranar Bone White
				Berridge	Product: Color:	Custom Fabricated Metal PPG #UC128109 (AMMA 2605) Duranar Bone White
				Dimensiojnal Metals	Product: Color:	Custom Fabricated Metal PPG #UC128109 (AMMA 2605) Duranar Bone White
07 53 23	EPDM Membrane Roofing		Refer to Drawings	Refer to Specifications	Color:	White in locations approved by Marriott Representative
07 62 00	Copings & Gravel Stops				Color:	To Match Adjacent Wall Color, as approved by Marriott Representative
07 72 33	Roof Hatch		If Required		Color:	Match adjacent roof surface color

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION	
07 81 23	Intumescent Paint	IPT1	Exterior and Interior Exposed Steel	Astroflame or Isolafect	Pattern: Color:	Eggshell finish To match PAC-CLAD Dark Bronze
07 92 00	Joint Sealants		Doors and Windows		Color:	Match adjacent wall surface color
			Control Joints		Color:	Match adjacent wall surface color
08 32 13	Sliding Aluminum-Framed Glass Doors			Control Color Powder Coat	Color:	AAMA 2604: Custom Color to match Aluminum Window Color, as approved by Marriott Representative (Polyester Similar to Envirocron 4)
					Color:	AAMA 2605: Custom Color to match Aluminum Window Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
				Control Color Liquid Fluoropolymer Coat	Color:	AAMA 2604: Custom Color to match Aluminum Window Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
					Color:	AAMA 2605: Custom Color to match Aluminum Window Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
08 41 13	Aluminum-Framed Entrances and Storefronts			Control Color Powder Coat	Color:	AAMA 2604: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
					Color:	AAMA 2605: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
				Control Color Liquid Fluoropolymer Coat	Color:	AAMA 2604: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
					Color:	AAMA 2605: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
				Color/Clear Anodized Coating	Color:	AAMA 611 Class I: Custom Color or Clear Anodized to match Aluminum Window Color, as approved by Marriott Representative

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION	
08 42 29	Automatic Entrance Doors			Control Color Powder Coat	Color:	AAMA 2604: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
					Color:	AAMA 2605: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
				Control Color Liquid Fluoropolymer Coat	Color:	AAMA 2604: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
					Color:	AAMA 2605: Custom Color to match Aluminum Window Color, as approved by Marriott Representative
				Color/Clear Anodized Coating	Color:	AAMA 611 Class I: Custom Color or Clear Anodized to match Aluminum Window Color, as approved by Marriott Representative
Note: Select either Fiberglass or Aluminum Windows. Delete Type not used.						
08 41 13	Fiberglass Windows				Color:	Dark Bronze, as approved by Marriott Representative
08 51 13	Aluminum Windows			Control Color Powder Coat	Color:	AAMA 2604: To Match Manufacturer's Standard Dark Bronze Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
					Color:	AAMA 2605: To Match Manufacturer's Standard Dark Bronze Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
				Control Color Liquid Fluoropolymer Coat	Color:	AAMA 2604: To Match Manufacturer's Standard Dark Bronze Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
					Color:	AAMA 2605: To Match Manufacturer's Standard Dark Bronze Color, as approved by Marriott Representative (Note: Clear or Color Anodized Finish NOT permitted)
08 80 00	Glass Color				Color:	Clear
09 96 00	Special Coatings		Pipe Bollard @ Entry		Color:	Dark Grey to match SP1
			Decorative Site Bollards		Color:	See Light Fixture Matrix
			Exterior Doors:		Color:	Paint to match adjacent building material color
			Exterior Door Frames:		Color:	Paint to match adjacent building material color
			Exterior Railings:		Color:	AMMA 2605 Dark Bronze Powder Coat to match windows

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION	
Design Standards (Division 23)	Exterior Louvers & Grilles		PTAC		Color:	AMMA 2605 Match adjacent building material color as approved by Owner's Representative
			All Other Louvers & Grilles		Color:	AMMA 2605 Match adjacent surface as approved by Owner's Representative
Light Fixture Matrix (Division 26)	Exterior Light Fixtures	Varies	Parking and Building Exterior			See 265100b - Light Fixture Matrix (Not Exterior Light Matrix) for all Lights and Finishes.
03 30 00	Standard Concrete	C4	Refer to Drawings		Texture: Color:	Non-slip broom finish Standard Concrete
32 13 13	Imprinted Concrete Paving	C1	Building Front Sidewalk (Plan South)	Sundek	System: Pattern: Color:	Classic Texture Custom linear pattern with 1'-0" W bands (Refer to drawings for pattern location and orientation)-- Sample to be submitted to Marriott for approval Custom to match Sherwin Williams SW9097 Soft Fawn -- Sample to be submitted to Marriott for approval
		C2	Exterior Courtyard	Sundek	System: Pattern: Color:	Classic Texture Custom 1'-4"x8" bricks laid in a running bond pattern (Refer to drawings for pattern location and orientation)-- Sample to be submitted to Marriott for approval Custom to match Sherwin Williams SW9097 Soft Fawn -- Sample to be submitted to Marriott for approval
		C3	Loggia	Sundek	System: Pattern: Color: Size:	Tuscan Copolymer Cementitious Troweled Applied Texture Finish VG-17MT - Custom to match the Tranceramica Tile - Ecocrete Collection (interior tile), Weathered Black Finish Rigatto IRS 1836131 Velaquez Gray with light ghost accent 18"x36"
	Exterior Concrete Pool Deck (Standard Finish)		Pool Deck Pool Patio		Texture: Color:	Non-slip broom finish (Refer to Marriott Loss Prevention)
03 35 36	Exterior Concrete Pool Deck Cementitious Coating (Warm Climates ONLY) (Optional Upgrade)		Pool Deck Pool Patio	Sundek	Texture: Color 1: Color 2: Pattern:	Classic Texture To match Imprinted Concrete (Section 32 13 13) - To Be Approved by Marriott International To match Imprinted Concrete (Section 32 13 13) - To Be Approved by Marriott International To match Imprinted Concrete (Section 32 13 13) - To Be Approved by Marriott International
				Mortex	Texture: Color 1: Color 2: Pattern:	Keystone Kool Deck Match Sundek as approved by Owner's Representative Match Sundek as approved by Owner's Representative To match Imprinted Concrete (Section 32 13 13) - To Be Approved by Marriott International

SPEC. SECTION	MATERIAL	MARK NO.	LOCATION	MANUF.	FINISH DESCRIPTION
32 31 29	Wood Fences and Gates	WD2	Exterior Courtyard Fence, Trellis & Trash Enclosure	Astroflame or Isolatect	Species: Cedar / Smooth Finish Color: Stained to match WD1

SECTION 092116

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated wallboard: For **all** wall and partition assemblies, provide Type X materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

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

2.2 INTERIOR GYPSUM BOARD

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

1. Georgia-Pacific Gypsum LLC.
2. National Gypsum Company.
3. USG Corporation.

B. Gypsum Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm), Type X
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm) Type X
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

E. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.

1. Products: Subject to compliance with requirements, provide the following:
   a. Georgia-Pacific Gypsum LLC; DensArmour Plus.
2. Core: 5/8 inch (15.9 mm), Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10.
5. To be used in the following locations: Pool Room, Pool Equipment Room, Water Service Room, and elsewhere indicated on the drawings.

F. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, provide the following:
   a. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
   b. National Gypsum Company; Gold Bond, e(2)XP.
   c. USG Corporation; Securock Glass Mat Sheathing.
2. Core: 5/8 inch (15.9 mm), Type X.

2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges. For use in wet areas.

1. Products: Subject to compliance with requirements, provide the following:
   a. Custom Building Products; Wonderboard.
   b. National Gypsum Company, Permabase Cement Board.
   c. USG Corporation; DUROCK Cement Board.
2. Thickness: 5/8 inch (15.9 mm).
3. Mold Resistance: ASTM D 3273, score of 10.

B. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges. For use in dry areas.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. American Gypsum.
   b. Georgia-Pacific Gypsum LLC.
   c. USG Corporation.
2. Core: 5/8 inch (15.9 mm), Type X.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

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

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.

C. Aluminum Trim: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.6 AUXILIARY MATERIALS

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

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).

D. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.

E. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

F. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Comply with ASTM C 840.

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

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these

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

D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

1. Control Joints: Install control joints at locations indicated on Drawings.

E. Prefill open joints, rounded or beveled edges, and damaged surface areas.

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

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

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
   a. Primer and its application to surfaces are specified in other Division 09 Sections.

H. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

SECTION 092116.23

GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Shaft-wall enclosures.
2. Chase enclosures.
3. Horizontal enclosures.

1.2 SUBMITTALS

A. Product Data: For each gypsum board shaft-wall assembly indicated.

1.3 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Provide materials and construction identical to those of assemblies with fire-resistance ratings determined according to ASTM E 119 by a testing and inspecting agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

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

1. American Gypsum Company.
2. G-P Gypsum.
3. National Gypsum Company.
4. USG Corporation.

2.2 GYPSUM BOARD SHAFT-WALL ASSEMBLIES, GENERAL

A. Provide materials and components complying with requirements of fire-resistance-rated assemblies indicated.

1. Provide panels in maximum lengths available to eliminate or minimize end-to-end butt joints.
2. Provide auxiliary materials complying with gypsum board shaft-wall assembly manufacturer's written recommendations.

2.3 PANEL PRODUCTS

A. Gypsum Liner Panels: Comply with ASTM C 442/C 442M.

1. Type X: Manufacturer's proprietary liner panels with moisture-resistant paper faces.

a. Core: 1 inch (25.4 mm) thick.
b. Long Edges: Double bevel.

2. Moisture- and Mold-Resistant Type X: Manufacturer's proprietary liner panels and with moisture- and mold-resistant core and surfaces; comply with ASTM D 3273.

a. Core: 1 inch (25.4 mm) thick.
b. Long Edges: Double bevel.

B. Gypsum Board: As specified in Division 09 Section "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

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

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

2.5 AUXILIARY MATERIALS

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

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes specified in Division 09 Section "Gypsum Board" that comply with gypsum board shaft-wall assembly manufacturer's written recommendations for application indicated.

C. Gypsum Base Joint-Reinforcing Materials: As specified in Division 09 Section "Gypsum Veneer Plastering."

D. Gypsum Board Joint-Treatment Materials: As specified in Division 09 Section "Gypsum Board."

E. Laminating Adhesive: Adhesive or joint compound recommended by manufacturer for directly adhering gypsum face-layer panels and gypsum-base face-layer panels to backing-layer panels in multilayer construction.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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

G. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft-wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

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

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

I. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

2.6 GYPSUM BOARD SHAFT-WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated on drawings.

B. STC Rating: As indicated on drawings.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth [2-1/2 inches (64 mm)]
2. Minimum Base-Metal Thickness [0.0220 inch (0.55 mm)]

D. Runner Tracks: Manufacturer's standard J-profile track with long-leg length as standard with manufacturer, but at least 2 inches (51 mm) long and in depth matching studs.

1. Minimum Base-Metal Thickness: [Matching steel studs]

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

F. Jamb Struts: Manufacturer's standard J-profile strut with long-leg length of 3 inches (76 mm), in depth matching studs, and not less than 0.0329 inch (0.84 mm) thick.

G. Room-Side Finish: As indicated.

H. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

I. Insulation: Sound attenuation blankets.

PART 3 - EXECUTION

3.1 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft-wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft-wall assemblies to comply with requirements specified in Division 07 Section "Applied Fireproofing."

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runner tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft-wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.2 INSTALLATION

A. General: Install gypsum board shaft-wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and the following:

1. ASTM C 754 for installing steel framing except comply with framing spacing indicated.
2. Division 09 Section "Gypsum Board" for applying and finishing panels.

B. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft-wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, and similar items that cannot be supported directly by shaft-wall assembly framing.

D. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect, while maintaining fire-resistance rating of gypsum board shaft-wall assemblies.

H. Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly. Install acoustical sealant to withstand dislocation by air-pressure differential between shaft and external spaces; maintain an airtight and smoke-tight seal; and comply with ASTM C 919 requirements or with manufacturer's written instructions, whichever are more stringent.

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

3.3 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 09 22 26

DRYWALL GRID SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Metal suspension system for the support of gypsum drywall in ceiling, a soffit installation for interior and exterior finishes.

1.2 RELATED SECTIONS

A. Section 09 51 00 - Acoustical Ceilings

B. Section 09 21 16 - Gypsum Board

C. Division 23 Heating Ventilating and Air Conditioning (HVAC)

D. Division 26 Electrical

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM A 1008 Standard specification for the Steel, Sheet, Cold Rolled Carbon, Structural, High Strength Low-Alloy and High Strength Low Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire.
3. ASTM C 635 Standard Specification for Metal Suspension Systems
4. ASTM C 645-09 - Standard Specification for Nonstructural Steel Framing Members
5. **A**STM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
6. ASTM C841 Standard Specification for Installation of Interior Lathing and Furring
7. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Material
8. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
9. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
10. International Code Council Evaluation Service Report ESR-1289 for Drywall Grid

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of Metal Framing system required.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

B. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

C. Fire Resistance Characteristics: For fire-resistance-rated assemblies that incorporate Metal framing systems provide materials and construction identical to those tested in fire resistance assembly as indicated in the construction documents and or architectural plans in accordance with ASTM E119.

1.6 DELIVERY, STORAGE AND HANDLING

Protect and store products in manufacturer's unopened packaging until ready for installation.

1.8 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.

1.9 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Grid: One (1) year from date of substantial completion

C. The Warranty shall not deprive the Owner of other rights the 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 the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Suspension Systems:

1. Armstrong World Industries, Inc. or approved equal

B. Aluminum Custom Perimeter Trim Extruded:

(a) Armstrong World Industries, Inc. or approved equal

C. Perimeter Systems:

1. Armstrong World Industries, Inc. or approved equal

2.2.1 DRYWALL SUSPENSION SYSTEMS

A. Armstrong Drywall Suspension Systems all main beams and cross tees shall be commercial quality hot-dipped galvanized steel

1. Tee: manufactured main beam- 1-1/2" knurled face with ScrewStop™ reverse hem by 1-11/16 inches high. Drywall Main Beams are factory punched with crosstee routs and hanger wire holes and

SuperLock™ main beam clip for a strong secure connection and fast accurate alignment. Both ShortSpan and Drywall Main Beams are Heavy-duty performance per ASTM C635

7940 - 3600mm Drywall Main Beam 38 mm

2. Cross Tees: manufactured main beam- 1-1/2" knurled face with ScrewStop™ reverse hem by 1-1/2 inches high with factory punched cross tee routs and hanger wire holes and XL stake on clip for a strong secure connection.

   7920 - 600mm Drywall Cross Tee

3. Wall Molding:

   7856 - 10ft F Molding for 5/8" Gypsum

4. Hanger wire: a Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three times the design load, but not less than 12-gauge.

5. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label

6. Life Cycle Assessment: Third Party Certified Environmental Product Declaration (EPD)

PART 3 - EXECUTION

3.1 EXAMINATION

A: Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.

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

C. Installation: In accordance with all approved plans, details, and manufacturer's installation guidelines located in the Armstrong Drywall Grid Systems and ShortSpan Installation Guides.

SECTION 093000

TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. All Tile listed in Interior Finish Schedule
2. Crack-suppression and waterproofing membrane for thin-set tile installations.
3. Metal edge strips installed as part of tile installations.
4. Grout Sealer.

1.2 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. Tile and Trim Units: 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

2.1 TILE PRODUCTS

A. Field units

1. Provide manufacturer and type as noted on the drawings and finish schedule.

B. Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable.

1. Base Cove: Cove
2. Base Cap: Bullnose.
3. Wainscot Cap: Bullnose.
4. External Corners: Bullnose.
5. Internal Corners: Cove.
6. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.35 mm) across nominal 4-inch (100-mm) dimension.

2.2 ACCESSORY MATERIALS

A. Thresholds: Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel to 1/2 inch (12.7 mm) or less, and finish bevel to match face of threshold.

1. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

B. Waterproofing, Crack-Suppression Membranes, and Sealer for Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.

1. Waterproofing
    a. Products:
        1) Schluter: Dirta with Ardex FB9L.
        2) Latricrete 9235.
        3) Noble Seal TS.
2. Crack Suppression Membrane
    a. Products:
        1) NCB Anti-Fracture membrane
        2) Noble Seal CIS
3. Latex-Portland Cement Product: Flexible mortar with acrylic-latex additive.
    a. Products:
        1) Boiardi Products Corporation; Elastiment 323.
        2) MAPEI Corporation; PRP 315.
        3) TEC Specialty Products Inc.; TA-324, Triple Flex.
4. Grout Sealer (Use sealer only with materials recommended by manufacturer).
    a. Products:
        1) Aqua Mix: Sealers choice 15 gold.
        2) Stone Lok: MLT Plus for use in kitchen and pool areas.

2.3 SETTING AND GROUTING MATERIALS

A. Manufacturers: As noted on Finish Specification.

B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.

C. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. For wall applications, provide nonsagging mortar.

D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Prepackaged dry-mortar mix containing dry additive to which only water must be added.
2. Prepackaged dry-mortar mix combined with liquid-latex additive.
3. For wall applications, provide nonsagging mortar.

2.4 MISCELLANEOUS MATERIALS

A. Elastomeric Sealants: Elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. One-Part, Mildew-Resistant Silicone: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for in-service exposures of high humidity and extreme temperatures.
    a. Products:
        1) Dow Corning Corporation; Dow Corning 786.
        2) GE Silicones; Sanitary 1700.
        3) Tremco, Inc.; Tremsil 600 White.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.

C. Metal Edge Strips: Angle or L-shape, stainless steel exposed-edge material.

D. Grout Sealer: Manufacturer's best product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.

C. Remove protrusions, bumps, and ridges by sanding or grinding.

D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.2 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. 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. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. 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 indicated.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.

I. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

1. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.

J. Install tile on floors with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Quarry Tile: 1/4 inch (6.35 mm)
3. Paver Tile: 1/4 inch (6.35 mm)

K. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

L. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

M. Install tile on walls with the following joint widths:

1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
2. Glazed Wall Tile: 1/16 inch (1.6 mm).

N. Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.3 FLOOR TILE INSTALLATION SCHEDULE

A. Interior floor installation on concrete; thin-set mortar; TCA F113.

1. Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: As noted on finish specifications.
3. Sealers: As noted above.

B. Interior floor installation on crack-suppression membrane over concrete; thin-set mortar; TCA F122.

1. Thin-Set Mortar: Latex-portland cement mortar.
2. Grout: As noted on finish specifications.
3. Sealers: As noted above.

3.4 WALL TILE INSTALLATION SCHEDULE

A. Interior wall installation over masonry or concrete; thin-set mortar; TCA W202.

1. Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: lymer-modified unsanded] grout.

B. Interior wall installation over gypsum board on metal studs; organic adhesive; TCA W242.

1. Grout: As noted on finish specifications.
2. Sealers: As noted above.

C. Interior wall installation; thin-set mortar; over gypsum board; TCA W243.

1. Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: As noted on finish specifications.
3. Sealers: As noted above.

END OF SECTION 093000

SECTION 095123

ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical tiles and concealed suspension systems for ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.

C. Samples: For each exposed finish.

D. Product test reports.

E. Research/evaluation reports.

F. Maintenance data.

1.3 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory.

B. Fire-Test-Response Characteristics:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

    a. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface-Burning Characteristics: Acoustical tiles complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.

    a. Smoke-Developed Index: 450 or less.

1.4 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. Acoustical Ceiling Units: Full-size tiles equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL TILE CEILINGS, GENERAL

A. Acoustical Tile Standard: Comply with ASTM E 1264.

B. Metal Suspension System Standard: Comply with ASTM C 635.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. .

D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.2 ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Reflected Ceiling Plans and in the Interior Finish Schedule, Section 090001.

B. Classification: Provide fire-resistance-rated tiles complying with ASTM E 1264 for type and form as follows:

C. Color: As indicated on Drawings Interior Finish Schedule, Section 090001.

D. Edge/Joint Detail: Beveled Tegular.

E. Thickness: As indicated in Interior Finish Schedule, Section 090001.

F. Modular Size: As indicated on Drawings and in Interior Finish Schedule, Section 090001.

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated in the Interior Finish Schedule, Section 090001.

B. Direct-Hung Suspension System: Intermediate-duty structural classification.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 636, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

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

F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

END OF SECTION 095123

SECTION 09 54 23

LINEAR LAMINATE METAL CEILING SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Perforated and un-perforated laminate metal ceiling panels
2. Acoustical backing.
3. Suspension assemblies
4. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, wall angles required for a complete installation.
5. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support direct-hung metal ceilings suspension system.
6. Coordinate layout and installation of items penetrating or being installed in ceiling systems with responsible trades.

B. Related Sections / Work:

1. Sections 05 40 00 – Cold-Formed metal Framing
2. Sections 09 20 00 – Plaster and Gypsum Board
3. Sections 09 50 00 – Acoustical Ceilings
4. Sections 09 90 00 – Paintings and Coatings
5. Division 23 – Heating, Ventilating and Air Conditioning
6. Division 26 - Electrical

C. Alternates (Substitutions):

1. Prior approval: unless otherwise provided for in the contract documents, proposed product substitutions may be submitted no later than 10 working days prior to the date established for receipt of bids. Approval of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability. Approved products will be set forth by addenda. If substitute products have not been approved by addenda, but are included in a bid, the specified products shall be provided without additional compensation.
2. Submittals which do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet the requirements for this section, including but not necessarily limited to the following: single source materials supplier (specified in Section 1.5); panel design, size, composition, color and finish; suspension system component profiles and sizes; and compliance with the referenced standards.

D. This Section covers the general requirements only for Acoustical Laminate Metal Ceilings as shown on the drawings. The supplying and installation of additional accessory features and other items not specifically mentioned herein, but which are necessary to make a complete installation shall also be included or clarified accordingly.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. A641 -"Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"
2. A653 - "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc- Iron Alloy Coated (Galvannealed) by the Hot-Dip process"
3. B209 - "Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate"
4. B633 - "Standard Specification for Electrodeposited Coatings of Zinc on Iron or Steel"
5. C423 - "Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method"
6. C635 - "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings"
7. C636 - "Recommended Practice for Installation of Metal Ceiling Suspensions Systems for Acoustical and Lay-in Panels"
8. D1002 - "Practice for Adhesion Resistance"
9. D1044 - "Practice for Abrasion Resistance"
10. D1876 – "Peel Resistance of Adhesives"
11. E84 - "Standard Test Method for Surface Burning Characteristics of Building Materials"
12. E488 - "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements"
13. E580 - "Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint"
14. E795 - "Standard Practices for Mounting Test Specimens during Sound Absorption Tests"
15. E1190 - "Standard Test Methods for Strength of Power Actuated Fasteners Installed in Structural Members"
16. E1264 - "Classification for Acoustical Ceiling Products"
17. E1477 - "Standard Test Method for Luminous Reflectance factor of Acoustical Materials by use of Integrating-Sphere Reflectometers"

B. American Architectural Manufacturers Association (AAMA) 620-02 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Aluminum Substrates.

D. Ceiling & Interior Systems Construction Association (CISCA) "Ceiling Systems Handbook".

E. Local Building Code (IBC), current edition requirements.

1.4 SUBMITTALS

A. Product Data: Manufacturers product data for each type of product specified in this section.

B. Shop (Coordination) Drawings: Submit shop drawings for reflected ceiling plans (RCP's), drawn to scale, and coordinating penetrations and ceiling mounted items. Show the following details:

1. Reflected ceiling plan including joint patterns & details.
2. Metal ceiling suspension system plan with appropriate components, suggested hanger locations & details.
3. Method of attaching suspension system hangers to building structure.
4. Ceiling-mounted items including: light fixtures, air outlets and inlets, speakers, sprinklers, and other interfaces.
5. Special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
6. Framing and support details for work supported by ceiling suspension system.
7. List of materials, dimensions, hanger fastenings and any special details.

8. Minimum drawing scale: 1/8” = 1’-0”.
9. Provide full scale drawings of perforation patterns. Provide minimum 1”=1’-0” scale layout for each panel type showing perforation layout and orientation as required.

D. Samples for Verification: Full-size units (or as specified below) of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.

1. 12-inch square, (acoustical) laminate metal pan units.
2. 12-inch long samples of each exposed molding or trim.
3. 12-inch long samples of each suspension component.

1.5 QUALITY ASSURANCE

A. Unless accepted otherwise by the Architect, use manufacturer and installers that employ a Quality Management System complying with the program described in ISO 9001-2008, or similar system.

B. Installer
1. To certify a minimum 5 years experience installing similar systems and scope to those specified.
2. Provide list of at least 5 successful installations with similar products and scope. Include names and contact numbers of Architect and employer for reference.

C. Manufacturer

1. To certify a minimum of 5 years experience as a manufacturing enterprise engaged in sales and production of similar products to those specified.
2. Provide support documentation including name and date of similar projects completed. Include names and contact numbers of Architect and employers for reference.
3. Manufacturer shall be single source and shall be the fabricator and supplier of appropriate major components.

D. Fire-Test-Response Characteristics: Provide acoustical laminate metal pan ceilings that comply with one of the following requirements:

1. The panels are made from a non-combustible aluminum core and tested in accordance with ASTM E84. A thin (no more than .025 inches), layer of veneer finish to bed applied. Surface-burning characteristics of acoustical metal pan ceilings per IBC Chapter 8 Section 803.

E. Pre-installation Conference: Conduct conference at Project site as directed by the project Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical composite metal ceiling units and suspension system components in original, unopened packages clearly labeled with the following information: name of manufacturing source and location; product type, description and quantity; clients name and shipping address.

B. Store components in a fully enclosed space where they will be protected against physical damage from direct moisture, significant change in humidity, direct sunlight, significant change in temperature, surface contamination, and any other preventable cause.

C. Exercise care in handling components to prevent damage to the surfaces and edges and prevent distortion or other physical damage. Comply with prescribed stacking instructions to prevent damage to the components

1.7 PROJECT CONDITIONS

A. Environmental Limitations

1. Do not install metal pan ceilings until after spaces are enclosed and weather tight and after wet work and work above ceilings is complete and accepted by project Architect. Do not store in unprotected space.
2. Maintain environmental conditions within limits recommended by manufacturer for optimum results.
   a. Maintain within a temperature range of 50-100 degrees.
   b. Maintain within a 20%-60% relative humidity.
3. Coordinate with other work supported by, adjacent to or penetrating through the ceiling system.

B. Do not install products in exterior space unless the system has been specifically designed and approved for exterior application.

C. If the project is located within range of moisture associated with large bodies of water (fresh or salt), necessary materials shall be finished with coatings appropriate to condition of use.

1.8 WARRANTY

A. Provide specified manufacturer warranty against defects in workmanship.

B. This warranty shall remain in effect for a minimum period of one (1) year from date of installation.

1.9 MAINTENANCE & EXTRA MATERIALS

A. Maintenance Instructions: Provide manufacturers standard maintenance and cleaning instructions for finishes provided.

B. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Only typical system components are included with attic stock.

1. Metal Ceiling Pan Units: Full-size units equal to 1 percent (1%) of amount installed.
2. Ceiling Suspension System Components: Quantity of each grid and exposed component equal to 1 percent (1%) of amount installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of design: Ceilings Plus - 6711 E. Washington Blvd., Los Angeles, CA 90040. 800-822-3411– www.ceilingsplus.com.

B. Supply specified item or comply with Section 01 60 00 “Substitutions”. Specified manufacturer’s standard of quality and manufacturing tolerances shall be the criteria for evaluating “equivalent” products. Substitution shall be equal to or of better quality than the specified product in the opinion of the Architect and / or owner.

2.2 MATERIALS

A. Ceiling Type MCP-1- Ceilings Plus “Planx / Mirra” Saranté finish or approved equal.

1. Panels are to be manufactured from single sheets of aluminum selected for surface flatness, smoothness and freedom from surface blemishes where exposed to view in a finished unit. Do not use material where the exposed surface exhibit pitting, seam marks, roller marks, stains, discolorations, or variations in flatness exceeding those permitted by referenced standards for stretcher-leveled aluminum alloy sheets.
2. Panels to die formed with a 1-1/4” vertical with .3” minimum integral returns on panel sides. No fasteners of any kind shall be visible on exposed face surfaces of ceiling panels or support tees. Down light openings and other ceiling penetrations shall be factory precision cut whenever viable. Roll forming is not acceptable.
3. Panel material shall be primed aluminum sheet type 3105 series alloy that has up to 90% recycled content. It shall be machine stretcher-leveled and a minimum of .032” thickness, or greater if required, so that the panel deflection does not exceed L/360.
4. The panel finish shall be:
   a. “Saranté” PVC free, laminate that is permanently bonded to the aluminum sheet with formaldehyde free, water based adhesive of minimum bond strength of 425 psi @ 25 degrees C.
5. Linear member width shall be as shown on drawings x 96” with a 13/16” reveal.
6. End Profile: Panel end joints are butt condition with integral splice unless specified otherwise. Integral panel end return shall be provided.
7. The plenum shall be 100% accessible.
8. Fire Tests: Complete system test including suspension, primed aluminum shall meet ASTM E 84 Class A.
9. Provide and install matching finish trim on each side of each suspended area (or as specified).

2.3 METAL SUSPENSION SYSTEMS. GENERAL

A. Metal Suspension Standard: Provide panel manufacturer's metal suspension systems of types, structural classifications, materials, and finishes indicated that comply with applicable ASTM C 635 requirements.

1. Main and cross runners to be Standard “Heavy Duty” tee bar (as per ASTM C635).
2. Face flange of main and cross runners to be factory finished matte black unless known otherwise.
3. Face flange of main runners to be slotted and factory formed to accept panel side flanges.
4. Provide suspension system made from steel sheet with an average recycled content such that post-consumer recycled content plus one half or pre consumer content is not less than 25 percent.

B. Suspension Systems: Provide complete suspensions systems with main runners, cross runners, hangers, trim molding, seismic retention clips, load resisting struts and other suspension components required to support ceiling and other ceiling supported construction (some of these parts may be supplied by the installer).

C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, “Direct-Hung”, unless otherwise indicated (supplied by installer).

1. Provide anchor, for use in the particular application, as approved by the “Structural Engineer of record”.
2. Structural substrate, as indicated to support attachment device, also to be approved by the “Structural Engineer of record”.

3. Anchors specified must provide corrosion resistance as per metal type and application.
   a. Anchors into Concrete (with or without steel deck)
      i. Pre-installed – Cast in Place Anchors
      ii. Post-installed - Expansion Anchors
      iii. Post-installed – Chemical Anchors
      iv. Post-installed – Powder Actuated Fasteners
   b. Anchors into Wood
      i. 1/4" min diameter with 1-/14" minimum penetration
   c. Anchors into Steel
      i. Clip or Clamp
      ii. Shot Pin
   d. Anchors into Steel Deck: This option requires special attention from both the "Structural Engineer of record" and the Professional Engineered retained to provide structural documents in order to coordinate detailing required to provide anchoring device.
4. "Direct-Hung" Suspensions Systems: System composed of main runners supported by hangers attached directly to building structure.
5. "Indirect-Hung" Suspension Systems: System composed of main runners connected to carrying channels that are attached by hangers to building structure, and complying with the following requirements:
   a. Hangers: Type and metal standard with ceiling system manufacturer, sized to comply with structural classification indicated.
   b. Wire Hangers, where applicable, Braces, and Ties: Provide wires complying with the following requirements:
      i. Zinc-Coated Carbon-Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
      ii. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 2mm diameter wire.
      iii. Extruded Aluminum members shall comply with ASTM B209.
   c. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
   d. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
   e. Angle Hangers: Angles with legs not less than 22mm wide, formed with 1mm thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation, with bolted connections.

2.4 FINISHES, GENERAL

A. Comply with "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturers standard factory-applied finish for type of system indicated unless specified otherwise.

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

C. Appearance of finished work: Painted or Anodized:

1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half range of approved samples.
2. Noticeable variation in same piece is not acceptable.
3. Variations in appearance of other components are acceptable if they are within range of approved samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical metal pan units to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders and comply with layout shown on reflected ceiling plans.

C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.3 INSTALLATION

A. General: Install acoustical metal pan ceilings, per manufacturers shop drawings provided, per manufacturer's written instructions and to comply with publications referenced below.

1. ClSCA "Ceiling Systems Handbook.
2. Standard for Ceiling Suspension System Installations - ASTM C 636.
3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E580
4. IBC (International Building Code) standard for Seismic Zone for local area.

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

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produce hanger spacings that interfere with location of hangers at spacing 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 and publications.
4. Where used 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; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Space hangers not more than 48 inches on center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches from ends of each member. Supply supporting calculations from licensed Structural Engineer verifying hanger spacing meets all requirements, when spacing exceed those recommended.
6. Fine level grid to 1/8 inch in 10 feet from specified elevation(s), square and true.
7. Adjust suspension system runners so they are square (within .5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

C. Secure bracing wires to ceiling suspension members and to supports acceptable to Architect / Engineer and or inspector. Suspend bracing from building's structural members and / or structural deck, as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs(unless directed otherwise).

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pan. Method of edge trim attachment and design of edge trims to be approved by Architect.

1. Screw attach moldings to substrate at intervals not more than 18” O.C. and not more than 6” from ends, leveling with ceding suspension system to a tolerance of 1/8” in 10’. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim without prior written approval or unless detailed otherwise.

F. Scribe and cut acoustical metal panel units for accurate fit at penetrations by, other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

G. Install metal panel units in coordination with suspension system.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise indicated. Install directionally patterned or textured panels in directions indicated on approved shop drawings. Panel-joints shall flow smoothly and in a straight line within 1/8” in 10’. Intersections shall be continuous.
2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.
3. Remove protective film from panels only when space is completely clean and free of airborne particles. Use white cotton gloves for final installation of panels into grid system.

3.4 ADJUSTING AND CLEANING

A. Adjust ceiling components to provide a consistent finish and appearance in conformity with established tolerances and requirements.

B. Clean exposed surfaces of acoustical metal panel ceilings and walls. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.

End of section

SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

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

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

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

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base: As noted in the Interior Finish Schedule, Section 090001..

B. Resilient Base Standard: ASTM F 1861.
1. Style: Cove (base with toe) or straight (flat or toeless).
2. Use cove with hard surface flooring and straight with carpet.

C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: As noted in the drawings and finish schedule.

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

F. Outside Corners: preformed.

G. Inside Corners: preformed.

H. Finish: As selected by Architect from manufacturer's full range.

I. Colors and Patterns: As noted in the drawings and finish schedule.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Johnsonite.

B. Description: Carpet edge for glue-down applications, Nosing for carpet, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet and Transition strips.

C. Material: Vinyl.

D. Profile and Dimensions: As indicated or selected by Architect from full range of profiles..

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

2.3 INSTALLATION MATERIALS

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

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

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Cove Base Adhesives: Not more than 50 g/L.
b. Rubber Floor Adhesives: Not more than 60 g/L.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)

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

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

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

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 RESILIENT BASE INSTALLATION

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

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

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

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

E. Do not stretch resilient base during installation.

3.3 RESILIENT ACCESSORY INSTALLATION

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

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

3.4 CLEANING AND PROTECTION

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

B. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096516

RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient sheet floor covering, without backing.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor coverings.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor covering installation.

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

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

PART 2 - PRODUCTS

2.1 RUBBER SHEET FLOOR COVERING

A. Products: As noted in the Interior Finish Schedule, Section 090001..

2.2 INSTALLATION MATERIALS

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

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.

C. Integral-Flash-Cove-Base Accessories:

1. Cove Strip: 1-inch (25-mm) radius provided or approved by manufacturer.
2. Cap Strip: Square stainless steel provided or approved by manufacturer.
3. Corners: Metal inside and outside corners and end stops provided or approved by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

B. Concrete Substrates: Prepare according to ASTM F 710.

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

D. Do not install floor coverings until they are same temperature as space where they are to be installed.

1. Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.2 FLOOR COVERING INSTALLATION

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

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor covering.

B. Cover floor coverings until Substantial Completion.

END OF SECTION 096516

SECTION 096519

RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive floor tile.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Close spaces to traffic during floor tile installation.

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

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

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

A. Products: As noted in the drawings and Interior Finish Schedule, Section 090001..

B. Tile Standard: ASTM F 1066.

C. Thickness: 1/8”.

D. Size: As noted in the drawings and finish schedule.

E. Colors and Patterns: As noted in the drawings and finish schedule.

2.2 INSTALLATION MATERIALS

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

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

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Vinyl Composition Floor Tile Adhesives: Not more than 50 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by floor covering manufacturer and as follows. Proceed with installation only after substrates pass testing.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

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

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

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

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.2 FLOOR TILE INSTALLATION

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

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

1. Lay tiles square with room axis unless noted otherwise in drawings.

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

1. Lay tiles with grain running in one direction unless noted otherwise in drawings.

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

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

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

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

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
1. Apply a minimum of 2 coats of sealer by manufacturer, if recommended.

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

1. Apply three coat(s).

C. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 –

TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes modular, carpet tile.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Type of installation.
3. Pattern type, location, and direction.
4. Pile direction.

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

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

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.9 WARRANTY

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

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide product as noted in the drawings and Interior Finish Schedule, Section 090001..

2.2 INSTALLATION ACCESSORIES

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

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.

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

D. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

E. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

F. Installation Method: As recommended in writing by carpet tile manufacturer.

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

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

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

J. 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 nonpermanent, nonstaining marking device.

K. Install pattern parallel to walls and borders.

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

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

M. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

N. Provide extra carpet tiles to the Owner for future use when replacing damaged tiles.

END OF SECTION 096813

SECTION 096816 - SHEET CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes tufted and woven carpet.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Carpet type, color, and dye lot.
3. Seam locations, types, and methods.
4. Pile direction.

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warrant: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

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

B. Fire-Test-Response Ratings: Where indicated, provide carpet identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.8 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

1.9 WARRANTY

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

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET

A. Products: Subject to compliance with requirements, provide the following:

1. As noted in the drawings and Interior Finish Schedule, Section 090001..

B. Color: As noted in the drawings and finish schedule.

C. Pattern: As noted in the drawings and finish schedule.

2.2 INSTALLATION ACCESSORIES

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

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

1. Use adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.

D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.

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

D. Preparation: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

E. Installation: Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:

1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
2. Stair Installation: Comply with CRI 104, Section 13, "Carpet on Stairs" for glue-down installation.

F. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

G. Do not bridge building expansion joints with carpet.

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

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

J. 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 nonpermanent, nonstaining marking device.

K. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

L. Perform the following operations immediately after installing carpet:

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

M. Protect installed carpet to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096816

SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl wall covering.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show location and extent of each wall-covering type.

C. Samples: For each type of wall covering and for each color, texture, and pattern required.

D. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:

    a. Flame-Spread Index: 25 or less.
    b. Smoke-Developed Index: 450 or less.
2. Fire-Growth Contribution: Textile wall coverings tested according to NFPA 265 and complying with test protocol and criteria in the 2006 IBC.
3. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.

    a. Approved mockups may become part of the completed work if undisturbed at time of substantial completion.

1.4 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. Rolls of Wall-Covering Materials: Full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 WALL COVERINGS

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

2.2 VINYL WALL COVERING

A. Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the Interior Finish Schedule, Section 090001.

B. Stain-Resistant Coating: Dupont; Tedlar/Reflon.

C. Colors, Textures, and Patterns: As noted in the drawings and finish schedule.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "Interior Painting" and recommended in writing by wall-covering manufacturer for intended substrate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Check Painted Surfaces for pigment bleeding. Sand gloss, semi-gloss, and eggshell finishes with fine sandpaper.

B. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

C. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

D. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

E. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

F. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

G. Match pattern 72 inches (1830 mm) above the finish floor.

H. Install seams vertical and plumb at least 6 inches (150 mm) from outside corners and 6 inches (150 mm) from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

I. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

J. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

END OF SECTION 097200

SECTION 09 81 00

ACOUSTIC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Related sections:
   1. 06 10 00 Rough Carpentry.
   2. 09 29 00 Gypsum Board.
   3. 09 51 00 Acoustical Ceilings.

1.2 REFERENCES

A. Standards of the following as referenced:
   1. ASTM.
   2. National Fire Protection Association (NFPA).
   3. Underwriters' Laboratories, Inc. (UL).

1.3 SUBMITTALS

A. Product data: Product data and installation instructions for each type insulation and installation.

B. Quality control submittals; certificates: Indicate materials supplied or installed are
   1. asbestos free.
   2. CFC-12 free.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acoustic batt insulation:
   1. In-wall sound attenuation batts (SAB):
      a. Acceptable products:
         1) CertainTeed Products Corp.; CertaPro™ AcoustaTherm™ Batts.
         2) Johns Manville Corp.; Sound Control Batts.
         3) Owens Corning; QuietSound® Acoustic Batts.
      b. Characteristics:
         1) Material: ASTM C665-06, Type I, unfaced flexible mineral fiber batt.
         2) Nominal density: 2.5 PCF, minimum.
         3) Thickness: Full stud depth, unless otherwise indicated on Drawings, follow stricter requirements.
         4) Size: Furnish batts net stud width, minimum; no odd sized pieces permitted.
         5) Combustibility; ASTM E136-02: Noncombustible.
         6) Surface burning characteristics; ASTM E84-12:
            a) Flame spread: 25 or less.
            b) Smoke developed: Zero.
         7) Corrosion: Will not cause or contribute to corrosion.
   2. Lay-in ceiling sound batts:
      a. Acceptable products:
         1) CertainTeed Products Corp.; CertaPro™ AcoustaTherm™ Batts.
         2) Johns Manville Corp.; Sound Control Batts.
         3) Owens Corning; QuietSound® Noise Control Batts.

b. Type:
   1) Material: ASTM C665-06, Type I, unfaced flexible mineral fiber batt.
   2) Size: 2'-0" by 4'-0" by 3½".

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Comply with manufacturer's product data for each type installation.
   2. Cut insulation around obstructions and protrusions.
   3. Remove projections interfering with installation.

B. Acoustic insulation installation:
   1. In-wall SAB insulation: Install in indicated sound isolating partitions filling cavities, full partition height, depth, and single length in accord with manufacturer's installation instructions.
   2. Lay-in ceiling SABs:
      a. Lay SABs over designated ceiling areas, insulation supported by suspension system; grid support not to exceed 24". Laying blankets directly on, and supported totally by, ceiling panels is prohibited.
      b. Install over entire indicated ceiling areas in single layer in accord with manufacturer's installation instructions.

END OF SECTION 09 81 00

SECTION 099113

EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Galvanized metal.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each finish and for each color and texture required.

C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

D. Exterior Painting Schedule.

1.3 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
   3. All field applied materials to comply with VOC limits set by state or local municipality having jurisdiction.

B. Colors: As noted in the drawings and in the Exterior Finish Schedule Section 090002

2.2 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.
   1. VOC Content: E Range of E2.

2.3 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.
   1. VOC Content: E Range of E1.

B. Quick-Drying Alkyd Metal Primer: MPI #76.
   1. VOC Content: E Range of E1.

C. Cementitious Galvanized-Metal Primer: MPI #26.
   1. VOC Content: E Range of E1.

D. Waterborne Galvanized-Metal Primer: MPI #134.
   1. VOC Content: E Range of E1.
   2. Environmental Performance Rating: EPR 1].

E. Quick-Drying Primer for Aluminum: MPI #95.

2.4 EXTERIOR LATEX PAINTS

A. Exterior Latex (Flat): MPI #10 (Gloss Level 1).
   1. VOC Content: E Range of E1.

B. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
   1. VOC Content: E Range of E1

2.5 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).
   1. VOC Content: E Range of E1.

B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
   1. VOC Content: E Range of E1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Masonry (Clay and CMU): 12 percent.
   3. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

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

3.3 EXTERIOR PAINTING SCHEDULE – To be Completed by Painting Contractor.

A. CMU Substrates:

   1. Latex System: MPI EXT 4.2A.
      a. Prime Coat: Interior/exterior latex block filler.
      b. Intermediate Coat: Exterior latex matching topcoat.

c. Topcoat: Exterior latex (flat).

B. Steel Substrates:

1. Quick-Drying Enamel System: MPI EXT 5.1A.
   a. Prime Coat: Quick-drying alkyd metal primer.
   b. Intermediate Coat: Quick-drying enamel matching topcoat.
   c. Topcoat: Quick-drying enamel (semigloss).

2. Alkyd System: MPI EXT 5.1D.
   a. Prime Coat: Alkyd anticorrosive metal primer.
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
   c. Topcoat: Exterior alkyd enamel (semigloss).

C. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3A.
   a. Prime Coat: Cementitious galvanized-metal primer.
   b. Intermediate Coat: Exterior latex matching topcoat.
   c. Topcoat: Exterior latex (semigloss).

2. Alkyd System: MPI EXT 5.3B.
   a. Prime Coat: Cementitious galvanized-metal primer.
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
   c. Topcoat: Exterior alkyd enamel (semigloss).

END OF SECTION 099113

SECTION 10 11 00 - VISUAL DISPLAY SURFACES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Decorative Merchandising Slotted Display Wall.

1.02 SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) with the following supporting data:

1. Submit product data which shall include physical dimensions, operational features, color and finish, anchorage details, rough-in measurements, location, and details.

2. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. "MegaWall Aluminum Slatwall"; MegaWall, Inc. (616-647-4190)

2. Approved Substitution

2.02 DISPLAY WALL

A. 1-sided Aluminum Panel Color: Powdercoated finish, custom color as shown on Drawings.

B. Panel Groove Insert Color: Color as shown on Drawings.

C. Overall Panel Dimension: As shown on Drawings.

D. Groove Spacing: 1-inch on centers.

E. Installation Method: Hidden Fastener system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install unit and level on wall. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 21 13

TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Extent of toilet partitions is indicated on Drawings.

2. Styles of toilet compartments include:

a. Compact Laminate Finished, Phenolic Core, Floor-Anchored, Overhead Braced

3. Styles of Screens include:

a. Compact Laminate Finished, Phenolic Core, Floor-Anchored

B. Related Sections:

1. Section 09 21 16 (09255) - Gypsum Board Assemblies

2. Section 09 30 00 (09310) - Tiling

3. Section 10 28 00 (10800) - Toilet, Bath, and Laundry Accessories

1.02 REFERENCES

A. Americans with Disabilities Act (ADA) II Public Accommodations

1. Americans with Disabilities Act Accessibility Guidelines (ADAAG)

B. ASTM International (ASTM) Publications:

1. A167 "Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

2. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

1.04 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to ensure proper fitting of work. However, allow for adjustments within specified tolerances wherever taking field measurements before fabrication might delay work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet partitions and related work; coordinate delivery with other work to avoid delay.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Accurate Partitions Corp. (708-442-6800)
   a. Toilet Compartments: “Floor Anchored/Overhead Braced Mounting Style”
   b. Urinal Screens: Floor mounted with post supports.
2. Knickerbocker Partition Corp. (516-546-0550)
   a. Toilet Comp: “Metropolitan”
   b. Urinal Screens: Floor mounted with post supports.
3. Metpar Corporation (888-638-7271)
   a. Toilet Compartments: "Corinthian FP-500"
   b. Urinal Screens: Type "PF"
4. Flush-Metal Partition Corporation (718-784-3380)
   a. Toilet Compartments: "Flushite"
   b. Urinal Screens: "PS-Post Supported"
5. Bobrick Washroom Equipment (818-764-1000)
   a. Toilet Compartments: No. 1042 Series, Overhead Braced
   b. Urinal Screens: No. 1043 Designer Series: 1541 Classic Series, Floor-Anchored.
6. Global Partitions (516-586-3330)
   a. Toilet Compartments: “Floor Anchored/Overhead Braced”
   b. Urinal Screens: Floor mounted with Post Support
7. Hadrian Manufacturing, Inc. (800-536-1469)
   a. Toilet Compartments: "Headrail Braced"
   b. Urinal Screens: Floor mounted with Post Support

2.02 MATERIALS

A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.

B. Panel Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges[**and no-sightline system**]. Provide minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels.

1. Refer to Interior Finish Index for facing sheet & edge color and pattern.

C. Concealed Anchorage Reinforcement: Minimum 12 gauge galvanized steel sheet.

D. Concealed Tapping Reinforcement: Minimum 14 gauge galvanized steel sheet.

E. Pilaster Shoes: ASTM A167, Type 304 stainless steel, not less than 3" high, 20-gauge, finished to match hardware.

F. Stirrup Brackets: Manufacturer's standard design for attaching panels to walls and pilasters, either chromium-plated non-ferrous cast alloy ("Zamac") or anodized aluminum.

G. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of stainless steel.

1. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match hardware, with theft-resistant type heads and nuts. For concealed anchors, use hot-dip galvanized, cadmium-plated, or other rust-resistant protective-coated steel.

H. Overhead Bracing: Continuous extruded aluminum, antigrip profile, with clear anodized finish.

2.03 FABRICATION

A. General: Furnish standard doors, panels, and pilasters fabricated for partition system, unless otherwise indicated. Furnish units with cutouts, drilled holes, and internal reinforcement to receive partition-mounted hardware, accessories, and grab bars, as indicated. Fabricate to fit dimensions shown on Drawings.

B. Door Dimensions: Unless otherwise indicated, furnish 24" wide in swinging doors for standard toilet compartments and 36" wide (32” clear opening) outswinging doors at stalls equipped for compartments shown as wheelchair accessible. [Provide 34” (32” clear opening) wide out-swinging doors for compartments shown as ambulatory compartments.]

C. Compact laminate panels can be cut, drilled and machined using standard wood-working equipment fitted with carbide cutting edges. Rough cuts can be made with carbide tip blades typically 62 tooth or greater on a table saw or Kane saw.

D. Overhead-Braced Compartments: Furnish galvanized steel supports and leveling bolts at pilasters as recommended by manufacturer to suit floor conditions. Make provisions for setting and securing continuous, extruded, aluminum, antigrip, overhead bracing at top of each pilaster.

1. Furnish galvanized steel anchorage devices complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters to permit structural connection at floor. Provide shoe at each pilaster to conceal anchorage.

E. Hardware: Furnish hardware for each compartment in partition system, as follows:

1. Hinges: Cutout inset type, adjustable to hold door open at any angle up to 90 degrees. Provide gravity type, spring-action cam type, or concealed torsion rod type, to suit manufacturer's standards.

2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.

3. Coat Hook: Manufacturer's standard unit, combination hook and rubber-tipped bumper, sized to prevent door hitting mounted accessories.

4. Door Pull: Manufacturer's standard unit for out-swing doors. Provide pulls on both faces of handicap compartment doors. Design shall be in conformance with ADA requirements.

2.04 FINISHES

A. Color: As indicated in Interior Finish Index.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Comply with manufacturer's recommended procedures and installation sequence. Install partitions rigid, straight, plumb, and level. Provide clearances of not more than 1/2" between pilasters and panels, and not more than 1" between panels and walls. Secure panels to walls with not less than two stirrup brackets attached near top and bottom of panel. Locate wall brackets so that holes for wall anchorages occur in masonry or tile joints. Secure panels to pilasters with not less than two stirrup brackets located to align with stirrup brackets at wall. Secure panels in position with manufacturer's recommended anchoring devices.

B. Floor Supported Partitions and Screens: Set pilaster units with anchorages having not less than 2" penetration into structural floor, unless otherwise recommended by partition manufacturer. Level, plumb, and tighten installation with devices furnished. Hang doors and adjust so that tops of doors are level with tops of pilasters when doors are in closed position.

C. Overhead Braced Compartments: Secure overhead brace to each pilaster with not less than two stirrup brackets. Hang doors and adjust so that top of doors are parallel with overhead brace when doors are in closed position.

D. Screens: Attach with anchoring devices as recommended by manufacturer to suit supporting structure set units to provide support and to resist lateral impact.

3.02 ADJUST AND CLEAN

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on inswinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition systems using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION

SECTION 102800

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bathrooms and washroom accessories.
2. Childcare accessories.
3. Underlavatory guards.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

C. Maintenance data.

D. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.4 WARRANTY

A. Special Mirror Warranty Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

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

PART 2 - PRODUCTS

2.1 BATHROOM AND WASHROOM ACCESSORIES

A. Refer to the Toilet and Bath Accessory Product Manual available from the architect or from Marriott. Provide exact products listed unless permission for substitution is obtained from Marriott.

2.2 UNDERLAVATORY GUARDS

Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings. Material and Finish: Antimicrobial, molded plastic, white.

2.3 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

END OF SECTION 102800

Toilet & Bath Accessory Matrix Courtyard by Marriott

Gen 6.5 – New Build – Inspired Classic

This Master Specification Document, as an Instrument of Service, is provided in confidence, for use in preparing final construction specifications for a Marriott CFRST Project. As such, this Master Specification Document shall remain the property of Marriott International, Inc. The use of this document for other projects (other than the Project specifically contracted for) is strictly prohibited without written authorization from Marriott International Design and Construction Services, Inc.

The content and information in this Master Specification is provided for format, and informational purposes only, and shall be replaced, modified, and edited as required to represent the actual project that the Architect, Engineer or Design Professional has been contracted to produce. Selected notes, tables, indexes information and technical data, etc. must be reviewed and modified to meet the specific requirement of the Project.

This specification is not project nor code-specific. It is the responsibility of the contracted Architect, Engineer or Design Professional to produce Contract Documents in conformance with the approved Scope of Work and in full compliance with all applicable current local, state and national codes, ordinances, laws, rules and requirements of applicable regulatory agencies.

USER GUIDE:

This Toilet and Bath Accessory Matrix is intended to be used as a companion document to the ***"Toilet and Bath Accessory Product Manual"*** for each Marriott CFRST Brand.

The mark numbers used for the CFRST toilet and bath accessories are universal across the CFRST brands and identify **the type** of bath accessory used at each location within a Project (i.e. Mark number 324 is a 24" grab bar and the mark number will be the same for a 24" grab bar within each CFRST brand regardless of which manufacturer, style, model number, or finish it is).

To determine the manufacturers, style, model number, and finish for the specific CFRST brand, the ***"Toilet & Bath Accessory Matrix"*** must be referenced. Within this brand matrix the acceptable manufacturers, style, model number, and finish are listed for each individual item for that CFRST brand.

Additionally, cut sheets for this item are included in the ***"Toilet & Bath Accessory Product Manual"***. However, this manual also contains the acceptable styles (by model numbers) listed as the same mark number for the other Marriott brands, so care must be taken to access the appropriate product cut sheet for that CFRST brand.

Toilet & Bath Accessory Matrix — Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
120		Toilet Tissue Holder - Double (Heavy Duty)	US32D	American Specialties, Inc.	AS 7305-2B	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-686	Gen 6.5 Inspired Classic	Public	Restroom
900		Feminine Napkin Vendor (Wall Mtd)	US32D	American Specialties, Inc.	AS 0864	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-2800	Gen 6.5 Inspired Classic	Public	Restroom
910		Paper Towel Disp / Disposal (Recessed)	US32D	American Specialties, Inc.	AS 0469-BL	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-3944	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	GAMCO, Inc., A Bobrick Company	GA TW-1-18	Gen 6.5 Inspired Classic	Public	Restroom
920		Soap Dispenser (Wall Mtd.)	US32D	Bobrick Washroom Equipment, Inc	B-2112	Gen 6.5 Inspired Classic	Public	Restroom
925		Soap Dispenser (Lavatory-Mtd., Top Load, 6" Spout, 34 oz)	US32D	American Specialties, Inc.	AS 0332D	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-8226	Gen 6.5 Inspired Classic	Public	Restroom
930		Seat Cover Dispenser (Dual - Partition Mtd.)	US32D	American Specialties, Inc.	AS 0476	Gen 6.5 Inspired Classic	Public	Restroom
931		Seat Cover Dispenser (Single Recessed)	US32D	American Specialties, Inc.	AS 6477	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-301	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	GAMCO, Inc., A Bobrick Company	GA TSC-8	Gen 6.5 Inspired Classic	Public	Restroom

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
940		Feminine Napkin Disposal (Wall Mtd.)	US32D	American Specialties, Inc.	AS 0473-1	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-353	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	GAMCO, Inc., A Bobrick Company	GA ND-4	Gen 6.5 Inspired Classic	Public	Restroom
941		Feminine Napkin Disposal (Partition Mtd.)	US32D	American Specialties, Inc.	AS 0472-1	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-354	Gen 6.5 Inspired Classic	Public	Restroom
			US32D	GAMCO, Inc., A Bobrick Company	GA ND-6	Gen 6.5 Inspired Classic	Public	Restroom
3181		Grab Bar 18"	US32D	Preferred Bath Accessories LLC	6018-SS (Balance Series)	Gen 6.5 Inspired Classic	Public	Restroom (Accessible Lav)
			US32D	WingIt Innovations	WGB5MESN18M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Public	Restroom (Accessible Lav)
3361		Grab Bar 36"	US32D	Preferred Bath Accessories LLC	6036-SS (Balance Series)	Gen 6.5 Inspired Classic	Public	Restroom (Accessible Lav)
			US32D	WingIt Innovations	WGB5MESN36M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Public	Restroom (Accessible Lav)
3421		Grab Bar 42"	US32D	Preferred Bath Accessories LLC	6042-SS (Balance Series)	Gen 6.5 Inspired Classic	Public	Restroom (Accessible Lav)

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
3421		Grab Bar 42"	US32D	WingIt Innovations	WGB5MESN42M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Public	Restroom (Accessible Lav)
113		Toilet Tissue Holder - Reversable for LH or RH mount. (Note: Adhesive tape not required, mounts with two screws)	US26	Preferred Bath Accessories LLC	PC2008 (Horizontal) PC2008ER (Vertical)	Gen 6.5 Inspired Classic	Guestroom	Bathroom
113 (ALT 1)		Toilet Tissue Holder - Horizontal (Note: Reversable for LH or RH mount) and Vertical (For Backup Refill) (Note: In addition to fastener, install "Very High Bond (VHB)" adhesive tape by 3M behind the standoff to assist in preventing rotation)	US32	WingIt Innovations	WMEHVTPHPSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom
212		Towel Bar - 12"	US26	Preferred Bath Accessories LLC	PC2012	Gen 6.5 Inspired Classic	Guestroom	Bathroom
			US26	Symmons Industries Inc.	353TB-12	Gen 6.5 Inspired Classic	Guestroom	Bathroom
212 (ALT1)		Towel Bar - 12" Alternate	US32	WingIt Innovations	WMETBPS12M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom
220		Towel Bar - 20"	US26	Preferred Bath Accessories LLC	2020-PC-MV-CM	Gen 6.5 Inspired Classic	Guestroom	Bathroom
			US26	Symmons Industries Inc.	CD0100-3VMTB-20	Gen 6.5 Inspired Classic	Guestroom	Bathroom
			US26	WingIt Innovations	WIETBVMPS20M (INFINITE Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom
224		Towel Bar - 24"	US26	Preferred Bath Accessories LLC	PC2024	Gen 6.5 Inspired Classic	Guestroom	Bathroom

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
224		Towel Bar - 24"	US26	Symmons Industries Inc.	353TB-24	Gen 6.5 Inspired Classic	Guestroom	Bathroom
224 (ALT1)		Towel Bar - 24" Alternate	US32	WingIt Innovations	WMETBPS24M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom
271		Robe Hook - Single (Wall Mtd.) (Note: All Robe Hooks within room shall be matching series by same manufacturer)	US26	Preferred Bath Accessories LLC	PC2000	Gen 6.5 Inspired Classic	Guestroom	Bathroom
			US26	Symmons Industries Inc.	353RH	Gen 6.5 Inspired Classic	Guestroom	Bathroom
271 (ALT 1)			US32	WingIt Innovations	WMESRHPSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom
282		Robe Hook - Single (Glass Mtd.) (Note: All Robe Hooks within room shall be matching series by same manufacturer)	US26	Preferred Bath Accessories LLC	PC2000GM	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			US26	Symmons Industries Inc.	CD0142-353GMRH	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
282 (ALT 1)			US32	WingIt Innovations	WMESRHGMPSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
3121		Grab Bar 12"	US32	Preferred Bath Accessories LLC	6012-BP (Balance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			US32	WingIt Innovations	WGB5MEPS12M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
452		Fixed Glass Panel at Shower including: (A) Glass Fixed Panel (B1) U-Channels (B2) Ceiling Clamps (B3) Floor Clips	Polished Chrome	See Section 10 28 19.21 for Manufacturer and Components		Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
452 (OPT)		Glass Shower Door w/Fixed Panel including: (A) Glass Fixed Panel (B1) U-Channels (B2) Ceiling Clamps (B3) Floor Clips (C) Hinges (D) Pull Handles/Towel Bar (E) Door Wipe/Drip Rail (F) Polycarbonate Strike	Polished Chrome	See Section 10 28 19.21 for Manufacturer and Components		Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
462		Glass Shower Door w/Fixed Panel including: (A) Glass Fixed Panel (B1) U-Channels (B2) Ceiling Clamps (B3) Floor Clips (C) Hinges (D) Pull Handles/Towel Bar (E) Door Wipe/Drip Rail (F) Polycarbonate Strike (G) 5'-0" Assembly for King Mod	Polished Chrome	See Section 10 28 19.21 for Manufacturer and Components		Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
522		Soap Basket - Corner basket w/ flat bottom and slots	US32	Preferred Bath Accessories LLC	308-BP	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			US26	Symmons Industries Inc.	CD01003-SB	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			US32	WingIt Innovations	WCONCBPS8M (CONTOUR Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
550		Foot Rest -Tapered Curve, 6" to 1/2"D Taper x 30"W (includes screws, standoffs and WingITS) (Refer to Tub and Shower Surround Product Manual for Surrounds and IFI for Surround Color)	Bright White w/textured finish on top	IMI	FR-NS30-SI	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
		Foot Rest -Tapered Curve, 6" to 1/2"D Taper x 30"W (includes screws, standoffs and WingITS) (Refer to Tub and Shower Surround Product Manual for Surrounds and IFI for Surround Color)	#2250 Solid White w/textured finish on top	Mincey Marble Manufacturing, Inc.	FR-03	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#SC-BW Bright White w/textured finish on top	MPL Corporation	FR-01	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
555		Accessory Ledge - Rectangular with Square Edge, 3"D x 30"W (includes screws, standoffs and WingITS) (Refer to Tub and Shower Surround Product Manual for Surrounds and IFI for Surround Color)	White	IMI	AL-C15	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#820 White	Mgroup	Ledge_3x30	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#2250 Solid White	Mincey Marble Manufacturing, Inc.	SS-03	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#SC-BW Bright White	MPL Corporation	AS-02	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
560		Accessory Niche at Standard Shower	#820 White	MGroup	NOOK-12X12X16-CN	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#2250 Solid White	Mincey Marble Manufacturing, Inc.	AN-05	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#SC-BW Bright White	MPL Corporation	A-N	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
586		Cast Marble Shower Base with integral flanges at back and sides, w/ Slip-resistant finish, offset Trench Drain with Brushed Nickel Trench Drain Cover (coordinate left or right). 72" x 34" x 4"	SW-304 Solid White Caulking color to match surround	IMI	SB72X34-3.5TD-Xh-LC	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			Solid White Caulking color to match surround	Mgroup	3472-T-O-[L or R]-3.25	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
			#2250 Solid White - Matte Finish Caulking color to match surround	Mincey Marble Manufacturing, Inc.	"Mincey Classic" TD-3472-OS/IF-[L or R]	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
586		Cast Marble Shower Base with integral flanges at back and sides, w/ Slip-resistant finish, offset Trench Drain with Brushed Nickel Trench Drain Cover (coordinate left or right). 72" x 34" x 4"	#SC-BW Bright White Matte w/ Gloss Finish Caulking color to match surround	MPL Corporation	TR-OS[L or R]72x34	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
		Solid Surface Low Profile Shower Pan, w/ Slip-resistant finish, offset Trench Drain with Brushed Nickel Trench Drain Cover (coordinate left or right). 72" x 34" x 4"	Argo "Papier White" Caulking color to match surround	Belstone	BMP-3472[L or R]-LD	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
588		Cast Iron with Safeguard finish with integral flange, left and right offset drain cover 60" x 34" x 4"	White (-0)	Kohler	Bellwether K-9193, K-9194	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
		Cast Marble Shower Base with integral flanges at back and sides, w/ Slip-resistant finish, offset Trench Drain with Brushed Nickel Trench Drain Cover (coordinate left or right). 60" x 34" x 4"	#2250 Solid White - Matte Finish Caulking color to match surround	Mincey Marble Manufacturing, Inc.	TD-3460-OS/SF-(L or R)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
588		Cast Marble Shower Base with integral flanges at back and sides, w/ Slip-resistant finish, offset Trench Drain with Brushed Nickel Trench Drain Cover (coordinate left or right). 60" x 34" x 4"	#SC-BW Bright White Matte w/ Gloss Finish Caulking color to match surround	MPL Corporation	60x34-TR-OS/L OR R	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Shower
3241		Grab Bar 24"	US32	Preferred Bath Accessories LLC	6024-BP (Balance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
			US32	WingIt Innovations	WGB5MEPS24M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
403		Shower Curtain Rod - Oval/Curved (6" Bow x 60" L) (New Build Projects)	US32	Franklin Brass, a Liberty Hardware Brand, A Masco Company	211-5SS	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
			US32	Preferred Bath Accessories LLC	113-5SS	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
			US32	WingIt Innovations	WOCONPS5NCM (CONTOUR OVAL Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
403R		Shower Curtain Rod - Oval/Curved (6" Bow x 60" L) (Renovation Projects - Includes WINGITS Fastening System)	US32	WingIt Innovations	WOCONPS5RENM (CONTOUR OVAL Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
522		Soap Basket - Corner basket w/ flat bottom and slots	US32	Preferred Bath Accessories LLC	308-BP	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
			US26	Symmons Industries Inc.	CD01003-SB	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Toilet & Bath Accessory Matrix — Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
522		Soap Basket - Corner basket w/ flat bottom and slots	US32	WingIt Innovations	WCONCBPS8M (CONTOUR Series)	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
561		Accessory Niche at Standard Tub	#820 White	MGroup	NOOK-12X16X8-C	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
			#2250 Solid White	Mincey Marble Manufacturing, Inc.	AN-08	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
			#SC-BW Bright White	MPL Corporation	A-N-TUB	Gen 6.5 Inspired Classic	Guestroom	Bathroom - Tub
113		Toilet Tissue Holder - Reversable for LH or RH mount. (Note: Adhesive tape not required, mounts with two screws)	US26	Preferred Bath Accessories LLC	PC2008 (Horizontal) PC2008ER (Vertical)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
113 (ALT 1)		Toilet Tissue Holder - Horizontal (Note: Reversable for LH or RH mount) and Vertical (For Backup Refill) (Note: In addition to fastener, install "Very High Bond (VHB)" adhesive tape by 3M behind the standoff to assist in preventing rotation)	US32	WingIt Innovations	WMEHVTPHPSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
212		Towel Bar - 12"	US26	Preferred Bath Accessories LLC	PC2012	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
			US26	Symmons Industries Inc.	353TB-12	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
212 (ALT1)		Towel Bar - 12" Alternate	US32	WingIt Innovations	WMETBPS12M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
224		Towel Bar - 24"	US26	Preferred Bath Accessories LLC	PC2024	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
224		Towel Bar - 24"	US26	Symmons Industries Inc.	353TB-24	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
224 (ALT1)		Towel Bar - 24" Alternate	US32	WingIt Innovations	WMETBPS24M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
271		Robe Hook - Single (Wall Mtd.) (Note: All Robe Hooks within room shall be matching series by same manufacturer)	US26	Preferred Bath Accessories LLC	PC2000	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
			US26	Symmons Industries Inc.	353RH	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
271 (ALT 1)			US32	WingIt Innovations	WMESRHPSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
			US32	WingIt Innovations	WMESRHPSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom
3181		Grab Bar 18"	US32	Preferred Bath Accessories LLC	6018-BP (Balance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	WingIt Innovations	WGB5MEPS18M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
3241		Grab Bar 24"	US32	Preferred Bath Accessories LLC	6024-BP (Balance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	WingIt Innovations	WGB5MEPS24M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
3241S		Grab Bar 24" with Sliding Handheld Shower Holder	US32	Preferred Bath Accessories LLC	6024-HSH-BP (Balance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	WingIt Innovations	WMESBA24PSM (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
3361		Grab Bar 36"	US32	Preferred Bath Accessories LLC	6036-BP (Balance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	WingIt Innovations	WGB5MEPS36M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
410		Shower Curtain Rod - Oval/Straight - 60" (Note: Design matches the 113-5SS curved shower rod)	US32	Preferred Bath Accessories LLC	113-5SS-SR	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	Preferred Bath Accessories LLC	113-5SS-SR	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
		Shower Curtain Rod - Oval/Straight - 60" **Note: (A) New Build: Use BAWFA Face Plate. (B) Reno: Use BAW30 WingIT Fastener where no blocking available.	US32	WingIt Innovations	WOCBST5M** (OVAL Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	WingIt Innovations	WOCBST5M** (OVAL Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
522		Soap Basket - Corner basket w/ flat bottom and slots	US32	Preferred Bath Accessories LLC	308-BP	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
522		Soap Basket - Corner basket w/ flat bottom and slots	US26	Symmons Industries Inc.	CD01003-SB	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			US32	WingIt Innovations	WCONCBPS8M (CONTOUR Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
580		Cast Marble Roll-In Shower Base with integral fiberglass flanges, w/ Slip-resistant finish, Center drain 62" (60" Clear) x 31" x 1-1/2" (at entrance)	Bright White Matte w/ Gloss Finish Caulking color to match surround	IMI	SB62x31-RI-ADA-LC	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			#820 White Caulking color to match surround	Mgroup	ADA-3162-S-C	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			#2250 Solid White - Matte Finish Caulking color to match surround	Mincey Marble Manufacturing, Inc.	"Mincey Classic" SP-3162-C/SF	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
580		Cast Marble Roll-In Shower Base with integral fiberglass flanges, w/ Slip-resistant finish, Center drain 62" (60" Clear) x 31" x 1-1/2" (at entrance)	#SC-BW Bright White Matte w/ Gloss Finish Caulking color to match surround	MPL Corporation	RISHP-3162	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
		Solid Surface Low Profile Shower Pan, w/ Slip-resistant finish, Center drain 62" (60" Clear) x 31" x 1-1/2" (at entrance)	Argo "Papier White" Caulking color to match surround	Belstone	BMP-3162-C-ADA	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
610		Shower Seat - Nylon Coated - Wall Mounted **For use with 30" Deep Shower Compartments** (Size complies with 2010 ADA)	WHT	Hafele America Co.	980.20.399 (LH) or 980.20.499 (RH)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			WHT	Preferred Bath Accessories	1800-LS-CRH-W	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
			WHT	WingIt Innovations	PUEX26xxWH (xx= LH / RH) (PURE Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
610 (ALT)			WHT	Preferred Bath Accessories	1800-LS-FDRH-W	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
640		Folding Edge Water Retainer & Threshold	ALUM	Shower Solutions USA, Inc.	Shower Water Dam	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Roll-In Shower
403		Shower Curtain Rod - Oval/Curved (6" Bow x 60" L) (New Build Projects)	US32	Franklin Brass, a Liberty Hardware Brand, A Masco Company	211-5SS	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
			US32	Preferred Bath Accessories LLC	113-5SS	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
			US32	WingIt Innovations	WOCONPS5NCM (CONTOUR OVAL Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
403R		Shower Curtain Rod - Oval/Curved (6" Bow x 60" L) (Renovation Projects - Includes WINGITS Fastening System)	US32	WingIt Innovations	WOCONPS5RENM (CONTOUR OVAL Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
522		Soap Basket - Corner basket w/ flat bottom and slots	US32	Preferred Bath Accessories LLC	308-BP	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
			US26	Symmons Industries Inc.	CD01003-SB	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
			US32	WingIt Innovations	WCONCBPS8M (CONTOUR Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
601		Tub Seat - Nylon Coated - Wall Mounted (Size complies with 2010 ADA)	WHT	Hafele America Co.	980.20.799.M	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub

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US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
601		Tub Seat - Nylon Coated - Wall Mounted (Size complies with 2010 ADA)	WHT	Preferred Bath Accessories	1800-FDTS-28-W	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
			WHT	WingIt Innovations	PUTB30WHM (PURE Elegance Series)	Gen 6.5 Inspired Classic	Guestroom	Accessible Bathroom - Tub
790		Ironing Board Caddy		Furnished by Others		Gen 6.5 Inspired Classic	Guestroom	Closet
705		Mirror w/ S/S Frame	US32D	American Specialties, Inc.	AS 0620 Series	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-165 Series	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
900		Feminine Napkin Vendor (Wall Mtd)	US32D	American Specialties, Inc.	AS 0864	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-2800	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
910		Paper Towel Disp / Disposal (Recessed)	US32D	American Specialties, Inc.	AS 0469-BL	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-3944	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
			US32D	GAMCO, Inc., A Bobrick Company	GA TW-1-18	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
920		Soap Dispenser (Wall Mtd.)	US32D	American Specialties, Inc.	AS 0342	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
			US32D	Bobrick Washroom Equipment, Inc	B-2112	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom
			US32D	GAMCO, Inc., A Bobrick Company	GA 58AP	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom

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US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
120		Toilet Tissue Holder - Double (Heavy Duty)	US32D	American Specialties, Inc.	AS 7305-2B	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	Bobrick Washroom Equipment, Inc	B-686	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
3181		Grab Bar 18"	US32D	Preferred Bath Accessories LLC	6018-SS (Balance Series)	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	WingIt Innovations	WGB5MESN18M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
3361		Grab Bar 36"	US32D	Preferred Bath Accessories LLC	6036-SS (Balance Series)	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	WingIt Innovations	WGB5MESN36M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
3421		Grab Bar 42"	US32D	Preferred Bath Accessories LLC	6042-SS (Balance Series)	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	WingIt Innovations	WGB5MESN42M (MODERN Elegance Series)	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
930		Seat Cover Dispenser (Dual - Partition Mtd.)	US32D	American Specialties, Inc.	AS 0476	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
931		Seat Cover Dispenser (Single Recessed)	US32D	American Specialties, Inc.	AS 6477	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet

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US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

Universal Mark (New)	Universal Mark (Old)	Description	Finish	Manufacturer	Model No.	Gen / Decor Scheme	Area	Location
931		Seat Cover Dispenser (Single Recessed)	US32D	Bobrick Washroom Equipment, Inc	B-301	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	GAMCO, Inc., A Bobrick Company	GA TSC-8	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
940		Feminine Napkin Disposal (Wall Mtd.)	US32D	American Specialties, Inc.	AS 0473-1	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	Bobrick Washroom Equipment, Inc	B-353	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet
			US32D	GAMCO, Inc., A Bobrick Company	GA ND-4	Gen 6.5 Inspired Classic	Back-of-House	Employee Restroom-Water Closet

Finish Codes: US26 = Chrome, Bright (Polished) US32 = Stainless Steel, Bright (Polished) US15 = Satin Nickel WHT =White
US26D = Chrome, Satin US32D = Stainless Steel, Satin

Note 1: Standard finish for Gen 5 Guestroom Bathrooms is Bright (Polished) Stainless Steel (US32) / Standard finish for Public/Back-of-House is Satin Stainless Steel (US32D).
Note 2: When adequate blocking is not available for grab bars, install grab bars using WingIts Grab Bar Fastener GBWME40. WingIT's Grab Bar Fasteners are compatible with WingITS and Bobrick Grab Bars, for all other manufacturers, adequate blocking must be provided.

SECTION 10 28 19

TUB AND SHOWER ENCLOSURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Frameless Shower Door with Fixed Glass Panel
2. Fixed Glass Panel at Shower
3. Attachment hardware

B. Related Sections:

1. Section 05 50 00 - Metal Fabrications
2. Section 06 10 00 - Rough Carpentry: Blocking
3. Section 06 61 13 -Cultured Marble Fabrications
4. Section 08 80 00 - Glazing: Unframed mirrors, tub and shower glass
5. Section 09 30 00 - Tiling: Coordinate installation of accessories
6. Section 10 21 13 - Toilet Compartments: Coordinate installation of accessories
7. Section 10 28 00 - Toilet Bath and Laundry Accessories

1.02 REFERENCES

A. ASTM International Publications:

1. A167 - "Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip"
2. A666 "Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar"

B. American National Standards Institute (ANSI)

1. ICC/ANSl A117.1-2009 , "Accessible and Useable Buildings and Facilities"

C. Americans with Disabilities Act (ADA) II Public Accommodations

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product Data: Mark each copy to identify applicable products, characteristics, models, options and other supplemental data to clearly communicate information specific to this project.
2. Shop Drawings: For tub and shower doors and enclosures.

1.04 QUALITY ASSURANCE

A. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same area.

B. Coordinate with Tub and Shower Surrounds specified in Section 06 61 13 "Cultured Marble Fabrications".

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

1. Build mockup of tub and shower doors and enclosure as shown on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver components to site until rooms in which they are to be installed are ready to receive them.

B. Store all materials to prevent physical damage or wetting.

C. Maintain protective covers on all units until final clean-up.

D. Protection: Protect adjacent or adjoining finished surfaces and work from damage during installation of work of this Section.

1.06 WARRANTY

A. Work of this Section shall be jointly warrantied by the manufacturer and the installer for a period of one year after final payment. Any material or workmanship that is judged defective during this period shall be replaced at no cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Continental Group (614-679-1201)

2. ProjectStone by Belstone (877-667-8663)

3. Mincey Marble Manufacturing Co. (800-533-1806)

2.02 MATERIALS

A. 18-8 (Type 302) stainless steel alloy of at least 22 gauge. Unless shown otherwise, all exposed stainless steel to have a #4 Satin finish or Satin chrome finish where applicable with all elements of a unit to have brushing in one direction.

B. Exposed surfaces to be protected with a factory applied PVC film to be left in place until final clean-up.

C. Stainless steel tubing: 18 ga., Type 304, seamless welded.

D. Glazing: Safety glazing materials complying with 16 CFR 1201, Category II, with permanently etched identification acceptable to authorities having jurisdiction.

E. Provide frameless glass panels with mounting and operating hardware of types and sizes required to support imposed loads.

F. Fasteners, screws, and bolts: Hot dip galvanized. Expansion shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component substrate.

G. Adhesive: Epoxy type contact cement.

2.03 FIXED GLASS PANEL AT SHOWER (450)

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Complete System: "Model BB817701-P"; Continental Group
2. Complete System: "Model Belstone RIFP84/38 & RIFP84/44 "; ProjectStone by Belstone (VERIFY SIZES WITH DRAWINGS)
3. Complete System: "Model MM-FG"; Mincey Marble Manufacturing Co.

C. Materials:

1. Glass Fixed Panel:
   a. 3/8" thick glass: Clear, tempered, polished edges.
   b. Size: Refer to Drawings for width and height.
2. U Channels for Fixed Panel: (One side of glass panel):
   a. Finish: Polished Chrome (Bright Anodized)
3. Fasteners: All fasteners to be by the manufacturer.
4. Adhesives: Type as per manufacturer's recommendations.
5. Sealant: Silicone type as per manufacturer's recommendations
6. Components:

Fixed Glass Panel MARK NO. 450			**ProjectStone by Belstone**	**Mincey Marble Manuf Co.**	**Continental Group**	
	Part	**Size**	**Model No.**	**Model No.**	**Model No.**	
a.	Fixed Panel	REFER TO DRAWINGS	RI8438GL/ RI8444GL	MM-HGD-02	BB817701-P	
b	U Channels	3/4" or 1" deep	RI8438UC.75/ RI8444UC.75	MM-HGD-06 / MM-HGD-07	BH817704	
c.	Glass Mounted Towel Bar for Fixed Panels	Refer to Toilet & Bath Accessory Matrix Mark Number 226				
d	Shower Surround	Refer to Section 06 61 13, Interior Finish Index and the Tub and Shower Surround Product Manual				
e.	Shower Pan	Refer to Toilet & Bath Accessory Matrix				
f.	Toilet and Bath Accessories	Refer to Section 10 28 00.				

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2.04 FRAMELESS SHOWER DOOR WITH ONE FIXED GLASS PANEL (OPT)

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Complete System: "Model BB817700"; Continental Group
2. Complete System: "Model Belstone RISD84/66, RISD84/60 & RISD84/54"; ProjectStone by Belstone (VERIFY SIZES WITH DRAWINGS)
3. Complete System: "Model MM-HINGED"; Mincey Marble Manufacturing Co.

C. Materials:

1. Glass:
   a. 3/8" thick glass: Clear, tempered, polished edges.

b. Size: Refer to Drawings for width and height.

2. U Channels for Fixed Panel:

a. Finish: Polished Chrome (Bright Anodized)

3. Hinges (C): Glass to Wall 90° inward and outward: Self-centering with reversible 5° pivot pin. Adjustable for glass thickness from 3/8" to 1/2".

a. Finish: Polished Chrome

4. Door Wipe and Drip Rail: Clear co-extruded polycarbonate bottom wipe with 45° drip rail to shed water back into shower. Dual wipes on bottom to create water tight seal. Wipe to snap onto bottom of door.

5. Polycarbonate Strike: Clear polycarbonate "h" jamb:

6. Fasteners: All fasteners to be by the manufacturer.

7. Adhesives: Type as per manufacturer's recommendations.

8. Sealant: Silicone type as per manufacturer's recommendations

9. Components:

FRAMELESS SHOWER DOOR WITH ONE FIXED GLASS PANEL MARK NO. 450 OPT			**ProjectStone by Belstone**	**Mincey Marble Manuf Co.**	**Continental Group**	
	Part	**Size**	**Model No.**	**Model No.**	**Model No.**	
a.	Door	REFER TO DRAWINGS	RI7266/84GD, RI7260/84GD, RI7254/84GD	MM-HGD-01	BB817700	
b	Fixed Panel	REFER TO DRAWINGS	RI7266FP/84, RI7260FP/84, RI7254FP/84	MM-HGD-02	BB817700	
c.	U Channels	3/4" or 1" deep	RI 72--/84UC75	MM-HGD-06 / MM-HGD-07	BH817704	
d	Hinges		RI 72--/84WH	MM-HGD-03	BH808500	
e	Back to Back Pull Handles		Refer to Toilet & Bath Accessory Matrix Mark Number 430			
f.	Door Wipe and Drip Rail		RI 72--/84DS	MM-HGD-04/ MM-HGD-05	42831902	
g	Polycarbonate Strike		RI 72--/84MC	MM-HGD-09	42831902	
h	Glass Mounted Towel Bar for Fixed Panels		Refer to Toilet & Bath Accessory Matrix Mark Number 226			
i.	Shower Surround		Refer to Section 06 61 13, Interior Finish Index and the Tub and Shower Surround Product Manual			
j.	Shower Pan		Refer to Toilet & Bath Accessory Matrix			
k	Toilet and Bath Accessories		Refer to Section 10 28 00.			

2.05 FINISHES

A. Exposed heads of fasteners shall match finish of accessory.

2.06 FABRICATION -

A. Provide steel anchor plates and anchor components for installation on building finishes.

B. Form surfaces flat without distortion. Maintain flat surface without scratches or dents.

C. Back paint components where contact is made with building finishes to prevent electrolysis.

D. Hot dip galvanize ferrous metal anchors and fastening devices.

E. Shop assemble components and package complete with anchors and fittings.

PART 3 EXECUTION

3.01 PREPARATION

A. Deliver inserts and rough-in frames to job site and in appropriate time for building-in. Provide templates and rough-in measurements as required.

B. Before starting work, notify Owner's Representative in writing of any conflicts detrimental to installation or operation of units.

C. Set units level, plumb, and true to line, without warp or rack of frames and panels, and anchor securely in place.

D. Fasten components securely in place, with provisions for thermal movement. Install with concealed fasteners unless otherwise indicated.

E. Install components to drain and return water to tub or shower.

F. Install doors to produce smooth operation and tight fit at contact points.

G. Verify with Owner's Representative exact location of accessories.

3.02 INSTALLATION

A. Install all enclosures in accordance with manufacturer's printed instructions.

B. Use concealed fastenings wherever possible.

C. Install true, plumb, and level, securely and rigidly anchored to substrate in accordance with manufacturer's instructions for each item and each type of substrate construction.

1. Wood blocking shall be provided at grab bars and fold down shower seats, and as shown on Drawings.

END OF SECTION

SECTION 10 31 00

MANUFACTURED FIREPLACES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fire Pit Insert
2. All Required Accessories

B. Related Sections:

1. Refer to Courtyard Interior Signage Specifications for Fire Pit Emergency Shut Off and Warning Plaque signage.
2. Division 23 Sections:
   a. Gas pipe to fire pit and connection to fire pit burner.
3. Division 26 Sections: Wall switch connected to gas log electronic ignition.

1.02 SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section 01 33 00 with the following supporting data:

1. Submit product data, mark each copy to identify applicable products, characteristics, models, options and other supplemental data to clearly communicate information specific to this project.
2. Shop Drawings and Samples: Submit copies of Shop Drawings of all items specified herein to Architect for approval. Obtain approval of drawings prior to proceeding with manufacturing. Shop Drawings shall indicate: elevations; details; location in the building of each item; conditions at openings with various wall thicknesses and materials; typical and special details of construction; methods of assembling sections; locations and installations requirements for hardware; size, shape, and thickness of materials; and joints and connections.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Firm with not less than 5 years of experience in installation of fireplace units of type, quantity, and installation methods similar to work of this Section.

B. All materials shall be installed in accordance with the manufacturer's printed directions.

C. Comply with the fire-resistance ratings as indicated and as required by governing authority and codes. Provide materials, accessories, and application procedures which have been listed by UL.

D. Verify that components and proposed installation comply with local and state requirements for both gas and wood burning fireplaces.

1.04 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.

PART 2 PRODUCTS

2.01 FIRE PIT INSERT

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. Hearth Products Control Co; (877-433-7001)
    a. "Model FPPK48-TRGH-FLEX"
        1) Pan: 48-inch
        2) T-Burner: 48-inch
        3) 36-inch Flex Line
        4) BTU: 90,000 (100,000 BTU maximum allowed by Marriott International)
    b. "Model FPPK60-TRGH-FLEX"
        1) Pan: 60-inch
        2) T-Burner: 60-inch
        3) 36-inch Flex Line
        4) BTU: 90,000 (100,000 BTU maximum allowed by Marriott International)
2. Refer to site drawings for size

C. Gas Fire Pit Kit:
1. Provide UL Certified, Linear Trough Fire Pit Insert Kit complete with #304 stainless steel pan and burner, FPPK-HC control box with pilot assembly and whistle-free flex line in location shown on Drawings.
    a. Provide complete with Pan, T-Burner, and Flex Line
    b. Provide complete valving, igniter, automatic shut off valve and connecting equipment for conditions indicated.
    c. Provide controls in locked, weatherproof enclosure. Control sequence shall completely shut off supply of gas to burner when flame is extinguished for any reason, and that require manually controlled ignition from control station located within line-of-sight of the fire pit insert.
        1) Provide "Model FPPK-VBMS" Control Box Mounting Sleeve

D. Accessories/Components:
1. Support Plate and Leveling Bolts: Manufacturer's standard.
2. Fire Pit Media, available through Hearth Products Control Co; (877-433-7001), Owner to select from the following options:
    a. Rolled Lava Stone
    b. Decorative Fire Pit Glass
    c. Lava Rock: 1" – 3" size.
    d. Ceramic River Rock, assorted sizes.
3. Emergency Flame Shut-Off Switch: Weatherproof maintained contact red mushroom head pushbutton switch with cover labeled "EMERGENCY SHUTOFF," suitable for wiring in series in low-voltage gas control circuit.
    a. Cutler-Hammer Div. Eaton Industries, HT800 Series two-position maintained push-pull button, Catalog HT8CBRB, mounted in recessed weathertight enclosure.
    b. Refer to Courtyard Interior Signage Specifications for sign adjacent to Emergency Shutoff Switch.
4. Custom fabricated stainless steel supports around edge of pan.
5. Custom fabricated stainless steel collar surrounding entire pan system. Refer to Drawings for size and location.

6. All other components required for complete installation.

7. Warning Plaques: Warning plaques, located on top of stone at locations as shown on Drawings, with text as follows oriented to be read from adjoining walking surfaces:

   a. "NOTICE: DO NOT LEAVE CHILDREN UNATTENDED."

   b. Refer to Courtyard Interior Signage Specifications for warning plaques.

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall inspect site conditions to which work is to be installed. Report discrepancies to Architect in writing.

B. Examine roughing-in for gas piping and electrical control wiring to verify actual locations of connections before equipment installation.

1. Provide underground gas line and associated trenching and filling in compliance with Division 33 Sections or the requirements of the local natural gas utility supplier and authorities having jurisdiction. Comply with requirements of Section 23 11 23 - Facility Natural Gas Piping for piping inside of building.

C. Verify that Fire Pit dimensions, clearances, combustion air ventilation and drainage are in accordance with manufacturer's published directions and listing requirements of the equipment being installed.

3.02 INSTALLATION – FIRE PIT INSERT

A. Install fire pit insert equipment in strict accordance with manufacturer's instructions and as required by appropriate fire authorities.

B. Install burner support plate assemblies using threaded rods and leveling nuts in accordance with manufacturer instructions and as follows:

1. Apply high-temperature threadlocking compound to threaded rod at leveling nut locations.

2. Install leveling nuts with lockwashers. Tighten to form rigid connection between support plate and threaded rod so that threaded rod functions as support legs for burner support plate assembly.

3. Coat cut-off ends of threaded rod with cold galvanizing compound.

4. Provide sleeve assemblies either surface mounted or installed in bottom of pit to receive ends of threaded rods

5. Mark orientation of leveled burner support plate assembly and pit with a single discernable paint marking or other mark to allow for correct re-positioning of assembly during maintenance activities.

C. Make connections to burner assembly in accordance with manufacturer instructions and as follows:

1. Provide electrical connectors listed and labeled for wet locations and suitable for use without supplemental applications of electrical tape.

2. Provide corrosion-resistant gas connectors and fittings suitable for exterior use. Provide flexible connector of appropriate length to allow for maintenance access to fire pit.

D. Install primary control station within unobstructed line of sight of the fire pit insert.

E. Install true, plumb, and level. When required by manufacturer's instructions securely and rigidly anchor components to substrate in accordance with manufacturer's instructions for each item and each type of substrate construction.

F. Installed gas piping, control wiring, tubing, hoses and clamps, must be hidden from view.

END OF SECTION

SECTION 104413

FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire protection cabinets for fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 1.5 mm thick, with Finish 1 polished.

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: as indicated on the drawings or comparable product from one of the following manufacturers:
   a. J. L. Industries, Inc.
   b. Larsen's Manufacturing Company.

B. Cabinet Construction: Nonrated where shown in non-rated partition; rated where shown in rated partition.

C. Cabinet Material: Steel sheet.

D. Cabinet Design: Cabinet box shall be recessed to the extent possible in the partition where shown. Partially recessed with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend) shall be permitted where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.

E. Door Material: Steel sheet.

F. Door Style: Fully glazed panel with frame.

G. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color: Clear transparent acrylic sheet.

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

I. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for lettering style, size, spacing, and location. Locate as directed by Architect.

J. Finishes:

1. Steel: Stainless.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Mite and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated 54" AFF to top of cabinet

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply vinyl lettering at locations indicated if required by authorities having jurisdiction.

E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Remaining paragraphs are defined in Division 01 Section "Submittal Procedures" as "Informational Submittals."Operation and maintenance data.

C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

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

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

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

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet indicated.

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

a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
c. Larsen's Manufacturing Company.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type: UL-rated at 2A – 10BC nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

C. Where fire extinguisher is shown or required but no cabinet is shown, provide extinguisher complete with wall-mounting bracket.

END OF SECTION 104416

SECTION 10 51 13

METAL LOCKERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Locker Units with Hinged Doors
2. Base, Top, and Filler Panels
3. Hooks, Latches, and Hardware
4. Attachment Hardware

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry: Blocking for attachment

1.02 SYSTEM DESCRIPTION

A. Lockers: Three-tier locker. Provide standard recessed padlock handle, number plate bases, end panels, filler panels, matching sloped top and top filler panels.

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data that clearly indicate locker types, sizes, configurations, layout of groups of lockers, benches, accessories, and numbering plan.
2. Submit manufacturer's installation instructions and actual color samples, on squares of same metal to be used for fabrication.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store and protect locker finishes and adjacent surfaces from damage during installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. "Industrial"; Lyon Workspace Products LLC (800-433-8488)
   a. Color: Refer to Interior Finish Index
2. "Vanguard Lockers"; Penco Products, Inc. (800-562-1000)
   a. Color: Refer to Interior Finish Index
3. "Emperor Locker System"; Hadrian Manufacturing, Inc. (905-333-0300)
   a. Color: Refer to Interior Finish Index

2.02 LOCKER MATERIALS

A. Sheet Steel: ASTM A1008, Mild, stretcher-leveled cold-rolled carbon sheet steel free of buckling, scale, and surface imperfections of the following minimum thicknesses:

1. Body and Shelf: 24 Gauge
2. Doors: 16 Gauge
3. Door Frames: 16 Gauge
4. Hinges: Minimum 2" wide, full loop, tight pin type.

2.03 LOCKER ACCESSORIES

A. Provide each locker with metal number plate, rubber bumpers, and hat/bookshelf.

2.04 LOCKER FABRICATION

A. Locker Units: Provide the following types in locations shown on the Drawings:

1. Three tier units, each locker to be 12" wide x 15" deep x 24" high.

B. Bodies: Formed and flanged with stiffener ribs; electrically spot welded.

C. Door Frame: Formed channel shape, welded and ground flush, welded to body.

D. Doors: Welded inner and outer faces; channel reinforced top and bottom with intermediate stiffener ribs. Finish edges smooth.

E. Hinges: Three full loop hinges. Weld securely to unit body and secure to door with no fewer than 2 factory installed fasteners that are completely concealed and tamperproof when door is closed.

F. Recessed Handle and Latch: Manufacturer's standard housing to form a recess for latch lifter and locking devices; non-protruding latch lifter containing strike and eye for padlock; and automatic, pre-locking, pry-resistant latch with latching action with not less than three-point latching. Locking device supplied by Owner.

G. Provide finished filler panels, end panels, continuous sloped 20-gauge metal tops and top filler panels to close off all openings, finished to match lockers.

1. Sloped tops are to be in lengths as long as practicable, but not less than four lockers.

H. Provide matching 12 gage, "Z" type base, 4" high at non-recessed lockers.

I. Trim: 3", 18 gauge steel matching trim for recessed lockers.

J. Provide full perimeter concealed ventilation system.

K. Finish edges smooth without burrs.

L. Provide number plates.

M. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, one-piece structure.

1. Form locker body panels, doors, shelves and accessories from one-piece steel sheet unless otherwise indicated.

N. Accessible Lockers:

1. Accessible Locker to meet ICC/ANSI A117.1-2003-Side Reach Requirement: Single tier lockers shall have a hat/book shelf and coat hooks located no more than 46-inches above

the finished floor. One additional shelf shall be placed near the bottom of the locker so that it is no lower than 15-inches above finished floor.

2. Apply a decal with the international symbol of accessibility to the face of the designated handicapped accessible single tier locker, refer to Drawings for location.

2.05 FINISHES

A. Clean, degrease, and neutralize metal; prime and finish with two coats of baked enamel, color as selected by Architect from standard colors.

B. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

C. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.

D. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipment.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within 1/2 of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify bases are properly sized and located.

3.02 INSTALLATION

A. Install metal lockers complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, flush and in-line.

B. Anchor lockers with appropriate anchor devices to suit materials encountered, to floor and walls. Apply fasteners through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

C. Bolt adjoining locker units together to provide rigid installation.

D. Install end panels, filler panels, and tops to completely close-off all openings.

E. Anchor lockers to floors and walls at intervals recommended by manufacturer but no greater than 36 inches (910 mm). Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

1. Install recess trim to recessed lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

2. Install sloping top units to lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

3. Install finished end panels to conceal exposed ends of non-recessed lockers.

3.03 ADJUST AND CLEAN

A. Adjust doors and latches to operate easily without bending. Verify that integral locking devices are operating properly.

B. Touch-up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

C. Clean interior and exposed exterior surfaces and polish steel and non-ferrous metal surfaces.

D. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.

END OF SECTION

SECTION 10 57 23 -

WIRE CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.01 SUMMARY

1. Wire Closet Shelves

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry

1.02 SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) with the following supporting data:

1. Mark each copy to identify applicable products, characteristics, models, options and other supplemental data to clearly communicate information specific to this Project.

2. Color Chart: Each product specified.

1.03 QUALITY ASSURANCE

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

B. Source Limitations: Obtain metal storage shelving through one source from a single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver storage shelving palleted, wrapped, or crated to provide protection during transit and Project-site storage.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

PART 2 PRODUCTS

2.01 WIRE CLOSET SHELVES

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. “Lifetime Ventilated Series Shelf with Hanging Rod”; Organized Living (888-674-5484)

C. Components:

1. Structural Performance:

a. Structural Performance: Back clips spaced 11 inches with support braces at 3 feet 6 inches.

b. Static Load: 75 lb/ft of shelf minimum.

c. For heavy duty applications in pantry and garage applications space support brace on 2 feet.

d. Back Clips and Down Back Clips shall be Tri-Loc II Patented hollow wall anchoring system.

2. Material: Minimum requirements.

a. Steel Rod: Grade C 1008 cold drawn steel rod. Tensile strength of 100 ksi.

b. Front Rods and Studs: 0.306 inch diameter.

c. Back Rods: 0.243 inch diameter.

d. Cross Wire Spacing: 1 inch spacing. 0.120 inch diameter for one inch spaced standard 20 inches shelf. 0.105 inch diameter for one inch spaced standard mesh shelf.

e. Cross Wire Spacing: 1/2 inch spacing. 0.0915 inch diameter for one-half inch spaced tight mesh shelf.

3. Shelving:

a. Hanging Shelf with Open Slide: 12 inches deep by length as shown on Drawings.

b. Storage Shelf: 12 inches deep by length as shown on Drawings.

4. Mounting Hardware: Manufacturer's standard components including anchor clips, end brackets, angled support braces and end caps, including the following:

a. Side Wall Bracket: As required. Shelf side wall interface.

b. Support Brace: Maximum 42 inches and every open end Anchor Back Clips.

c. Fasteners, clips, caps and touch-up all as required.

d. Down Back Clips.

D. Finish:

1. Electrostatic applied oven cured epoxy at all surfaces to 3 to 5 mil thickness.

a. Color: Pure White

E. Configurations:

1. Studio “A” Guestroom Wire Shelves: ~~(Drawing 420)~~

a. One (1) shelf to be provided full width of closet mounted at 68 inches above finished floor. Hanging rod to be located under open section of shelf.

1) Shelf Depth: 12 inches.

b. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 48” Wide)

Quantity	Part Number	Description
5	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
2	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
1	1430-6623-11	Tri-Loc II Anchor - White
1	1430-6659-11	12" Support Brace - White
4	1430-6693-11	Medium End Cap - White
4	1430-6694-11	Large End Cap - White

(1) 4’	1710-1212-11	12" D Open Slide Shelf -White

2. Connector Studio Guestroom Wire Shelves: ~~(Drawing 420a)~~

   a. One (1) shelf to be provided full width of closet mounted at 68 inches above finished floor. Hanging rod to be located under open section of shelf.

      1) Shelf Depth: 12 inches.

   b. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 55” Wide)

Quantity	Part Number	Description
6	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
2	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
1	1430-6623-11	Tri-Loc II Anchor - White
1	1430-6651-11	Double End Cap - White
1	1430-6659-11	12" Support Brace - White
4	1430-6693-11	Medium End Cap - White
4	1430-6694-11	Large End Cap - White
(1) 5’	1710-1212-11	12" D Open Slide Shelf -White

3. Accessible Studio “A” Guestroom Wire Shelves: ~~(Drawing 421)~~

   a. Two (2) shelves to be provided full width of closet mounted at 48 and 58 inches above finished floor. Hanging rod to be located under open section of bottom shelf.

      1) Shelf Depth: 12 inches.

   b. Three (3) additional 12” wide stacked shelves located to one side of closet below bottom shelf.

      1) Storage Shelves to be located at the following intervals: 12”, 24”, and 36”.

      2) Shelf Depth: 12 inches.

   c. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 55” Wide)

Quantity	Part Number	Description
(3) 1’	1210-1212-11	12" D Storage Shelf - White
(1) 4’	1210-1212-11	12" D Storage Shelf - White
14	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
7	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
5	1430-6665-11	Adjustable Pole Clip- White
2	1430-6671-11	Base Cap - White
1	1430-6673-11	84" Support Pole- White
28	1430-6693-11	Medium End Cap - White
12	1430-6694-11	Large End Cap - White
(1) 4’	1710-1212-11	12" D Open Slide Shelf -White

4. Studio “C” Guestroom Wire Shelves: ~~(Drawing 422)~~

   a. One (1) shelf to be provided full width of closet mounted at 68 inches above finished floor. Hanging rod to be located under open section of shelf.

      1) Shelf Depth: 12 inches.

b. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as require for complete installation.

Closet 1 (Up to 48" Wide)

Quantity	Part Number	Description
5	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
2	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
1	1430-6623-11	Tri-Loc II Anchor - White
1	1430-6659-11	12" Support Brace - White
4	1430-6693-11	Medium End Cap - White
4	1430-6694-11	Large End Cap - White
(1) 4'	1710-1212-11	12" D Open Slide Shelf -White

5. One Bedroom – End Unit Guestroom Wire Shelves: ~~(Drawing 425)~~

a. One (1) shelf to be provided full width of closet mounted at 68 inches above finished floor. Hanging rod to be located under open section of shelf.

1) Shelf Depth: 12 inches.

b. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 48" Wide)

Quantity	Part Number	Description
6	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
2	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
1	1430-6623-11	Tri-Loc II Anchor - White
1	1430-6659-11	12" Support Brace - White
4	1430-6693-11	Medium End Cap - White
4	1430-6694-11	Large End Cap - White
(1) 4'	1710-1212-11	12" D Open Slide Shelf -White

6. One Bedroom – End Unit - Accessible Guestroom Wire Shelves: ~~(Drawing 426)~~

a. Two (2) shelves to be provided full width of closet mounted at 48 and 58 inches above finished floor. Hanging rod to be located under open section of bottom shelf.

1) Shelf Depth: 12 inches.

b. Three (3) additional 12" wide stacked shelves located to one side of closet below bottom shelf.

1) Storage Shelves to be located at the following intervals: 12", 24", and 36".

2) Shelf Depth: 12 inches.

c. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 38" Wide)

Quantity	Part Number	Description
(2) 1'	1210-1212-11	12" D Storage Shelf - White
(1) 4'	1210-1212-11	12" D Storage Shelf - White
12	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
6	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
4	1430-6665-11	Adjustable Pole Clip- White

2	1430-6671-11	Base Cap - White
1	1430-6673-11	84" Support Pole- White
28	1430-6693-11	Medium End Cap - White
12	1430-6694-11	Large End Cap - White
(1) 4’	1710-1212-11	12" D Open Slide Shelf -White

7. Queen Queen - Guestroom Wire Shelves: ~~(Drawing 429)~~

   a. One (1) shelf to be provided full width of closet mounted at 68 inches above finished floor. Hanging rod to be located under open section of shelf.

      1) Shelf Depth: 12 inches.

   b. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 65” Wide)

Quantity	Part Number	Description
7	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
2	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
1	1430-6623-11	Tri-Loc II Anchor - White
1	1430-6659-11	12" Support Brace - White
4	1430-6693-11	Medium End Cap - White
4	1430-6694-11	Large End Cap - White
(1) 6’	1710-1212-11	12" D Open Slide Shelf -White

8. Queen Queen - Accessible Guestroom Wire Shelves: ~~(Drawing 430)~~

   a. Two (2) shelves to be provided full width of closet mounted at 48 and 58 inches above finished floor. Hanging rod to be located under open section of bottom shelf.

      1) Shelf Depth: 12 inches.

   b. Three (3) additional 12” wide stacked shelves located to one side of closet below bottom shelf.

      1) Storage Shelves to be located at the following intervals: 12”, 24”, and 36”.

      2) Shelf Depth: 12 inches.

   c. Parts List: The following is a parts list for this configuration. List shall be verified by Contractor to comply with actual room dimensions. Provide all other accessory components as required for complete installation.

Closet 1 (Up to 38” Wide)

Quantity	Part Number	Description
(2) 1’	1210-1212-11	12" D Storage Shelf - White
(1) 4’	1210-1212-11	12" D Storage Shelf - White
12	1430-6620-11	Versa-Clip w/ Tri-Loc II Anchor - White
6	1430-6621-11	Side Wall Bracket w/Tri-Loc II Anchor - White
4	1430-6665-11	Adjustable Pole Clip- White
2	1430-6671-11	Base Cap - White
1	1430-6673-11	84" Support Pole- White
28	1430-6684-11	Small Ventilated End Cap - White
12	1430-6686-11	Large Ventilated End Cap - White
(1) 4’	1710-1212-11	12" D Open Slide Shelf -White

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's published instructions, square and plumb, secured rigidly in position.

1. Layout scheduled components prior to installation to verify wall to wall and floor to ceiling heights, widths, plumb and flatness of surfaces.

2. Prepare anchor locations and select anchor types using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

END OF SECTION

SECTION 10 71 13

EXTERIOR SUN CONTROL DEVICES

GENERAL

SUMMARY

A. Section Includes:

1. Fixed blade extruded-aluminum exterior mounted louvered sunshades including attachment brackets and trim.

PERFORMANCE REQUIREMENTS

B. Design: Design sunshades, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.

C. Structural Performance: Sunshades shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of sunshade components and mounting brackets, or permanent damage to fasteners and anchors.

1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft. (1435 Pa), acting perpendicular to sunshade surfaces.

D. Thermal Movements: Provide sun control system that allows for thermal movements resulting from a maximum change in ambient and surface temperature as indicated without buckling, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Range: 120° F (49° C) ambient and 180° F (82° C) at material surfaces.

SUBMITTALS

E. Product Data: For each type of product indicated.

1. Include technical data demonstrating mounting and fastening methods, material descriptions, construction details, dimensions of assemblies and components, appearance details, and finishes.

F. Shop Drawings: For exterior sunshades and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

G. Samples: For each type of metal finish required.

H. Submittal: For sunshades indicated to comply with structural performance requirements and design criteria.

PRODUCTS

MATERIALS

I. Aluminum Extrusions: ASTM B 221M, Alloy 6063-T5.

J. Aluminum Sheet: ASTM B 209M, Alloy 3003 with temper as required for forming.

K. Fasteners: Use types and sizes to suit unit installation conditions.

1. For fastening aluminum, use aluminum or stainless-steel fasteners.

FABRICATION, GENERAL

L. Fabricate frames, including outriggers, in dimensions as indicated. Include allowances for fabrication and installation tolerances, adjoining material tolerances, and thermal movements.

M. Space the blades as indicated, and the outermost blades within the frame, to create a uniform appearance.

N. Join frame members to each other and to fixed louver blades with threaded fasteners concealed from view.

FIXED, EXTRUDED-ALUMINUM EXTERIOR SUNSHADES

O. Tube Profile Blade Louvered Sun Control System

1. Basis-of-Design Product: Architectural Louvers Co. (Harray, LLC); Model H6TS. Subject to compliance with requirements, provide the specified product or comparable product by one of the following:
    a. Manufacturers of equivalent products submitted and approved in accordance with Section 01 25 00 - Product Substitution Procedures.
2. Frame Depth: 6 inches (152 mm)
3. Trim Profile: Rectangular tube
4. Blade Profile: Rectangular tube blade
5. Blade Angle: 0°
6. Blade Spacing: 6 inches on center
7. Outrigger Thickness: Not less than 0.125 inch (2.54 mm) for structural shapes, not less than 0.25 inch (6.35 mm) for flat materials.
8. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).

ALUMINUM FINISHES

P. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

EXECUTION

INSTALLATION

Q. Locate and mount sunshades level, plumb, and at indicated alignment with adjacent work.

R. Use fastening and mounting methods in accordance with manufacturer instructions.

S. Use concealed anchorages where possible, with locations as directed by manufacturer instructions.

T. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.

U. Protect galvanized and unfinished nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

END OF SECTION 10 71 13

SECTION 12 32 13

MANUFACTURED WOOD-VENEER-FACED CASEWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Custom Cabinet Units
    a. Wood, Transparent Finish, Custom Cabinet Units
    b. Provide Cabinet Units that comply with Modular Casework Program guidelines.
2. Cabinet Hardware

B. Related Sections:

1. Section 06 61 00 - Rough Carpentry
2. Section 06 20 00 - Finish Carpentry
3. Section 12 32 16 – Manufactured Plastic Laminate Clad Casework
4. Section 12 36 23 - Plastic Countertops
5. Section 12 36 40 - Stone Countertops
6. Section 12 36 61 – Simulated Stone Countertops
7. Section 12 36 61.13 – Cultured Marble Countertops
8. Section 12 36 61.16 – Solid Surfacing Countertops
9. Section 12 36 63 – Ultracompact Surfacing Countertops
10. Division 22 for Plumbing Fixtures

1.02 REFERENCES

A. Architectural Woodwork Institute (AWI) / Architectural Woodwork Manufacturers Association of Canada (AWMAC) /Woodwork Institute (WI) Publications:

1. "Architectural Woodwork Standards (AWS)"

B. ASTM International (ASTM) Publications:

1. C1048 “Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass”
2. D523 “Standard Test Method for Specular Gloss”
3. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

C. American National Standards Institute (ANSI) Publications:

1. A135.4 Basic Hardboard
2. ANSI/KCMA A161.1 “Performance and Construction Standard for Kitchen and Vanity Cabinets
3. A161.2 “Standards for Fabricated High Pressure Decorative Laminate Countertops”
4. A208.1 "Standards for the Performance of Particleboard"
5. A208.2 “Medium Density Fiberboard (MDF) for Interior Applications.”

D. *[DW1]*Hardwood Plywood & Veneer Association (HPVA) Publications:

1. ANSI/HPVA HP-1: "American National Standard for Hardwood and Decorative Plywood"

E. National Electrical Manufacturer's Association (NEMA) Standards Publications:

1. NEMA LD3 "High Pressure Decorative Laminates"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

a. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

b. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.

1.04 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 PROJECT CONDITIONS

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

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

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. MillRock RiverRun Casework (540-438-5973)

2. R.B. Woodcraft, Inc. (315-474-2429)

3. J. Suss Industries Inc. (866-769-5666)

2.02 WOOD, TRANSPARENT FINISH CUSTOM BOX CABINET UNITS - GENERAL

A. All cabinets shall be the same construction type for the entire Project.

B. Quality Standard:

1. Perform work to meet the requirements of Custom Grade in accordance with the "Architectural Woodwork Standards (AWS)", unless noted otherwise manufactured from solid stock meeting the following requirements:

a. Minor warp which can be held flat and straight with normal nailing is permitted.

b. Natural and manufacturing defects in excess of those permitted in the grade specified are permitted if such defects are to be covered by adjoining members or otherwise concealed.

c. Trim members for application on flat surfaces shall have the reverse side "backed out", except members with exposed ends.

d. "Custom grade" pieces shall be smoothly machined with top flat surfaces machine sanded. Depressed flat surfaces and molded contours shall be smoothly machined.

2. Design: Style of face construction for base, wall, and full-height units, if any, with drawer fronts, doors, and fixed panels as follows:

a. Frameless.

b. Cabinet and Door Interface: Flush (Full) Overlay.

c. Flush Panel Doors.

d. Flush Panel Drawer Fronts.

e. Color: Refer to Interior Finish Index

3. Grain Direction:

a. Vertical on doors, horizontal on drawer fronts.

b. Vertical on end panels.

c. Side to side on bottoms and tops of units.

d. Vertical on knee-space panels.

e. Horizontal on aprons.

2.03 MATERIALS

A. Lumber shall be in accordance with the AWS Grade specified for the product being fabricated. Moisture content shall be 6% to 12% for boards up to 2-inches nominal thickness, and shall not exceed 19% for thicker pieces.

B. Solid Lumber: Dry, sound, selected to eliminate appearance defects. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings. Provide the following species:

1. [Hard Maple - "Select White" (Sapwood)] [or] [Yellow Birch - "Select White" (Sapwood)], plain (flat) sliced, custom grade.

C. Plywood Face Veneer: HPVA HP-1. Same species as exposed lumber, unless otherwise indicated, selected for grain and color compatible with exposed solid lumber, with Grade A faces and Grade C backs of same species as faces, no defects. Edgeband exposed edges with solid wood of same species as face veneer.

1. [Hard Maple - "Select White" (Sapwood), plain (flat) sliced] [or] [Yellow Birch - "Select White" (Sapwood), rotary sliced], custom grade.

D. Particle Board: ANSI A208.1, Mat-Formed Particle Board, Grade 1-M-2, with minimum density of 45 pcf. Internal bond of 60 psi, and minimum screw holding capacity of 225 lb. on faces and 200 lb. on edges.

E. Hardboard: ANSI A135.4, Class 1, tempered.

F. MDF: ANSI A208.2, Grade 130.

G. Thermoset Decorative Overlay (Melamine): Not less than 100 gram thermally fused, melamine-impregnated decorative paper, *[DW2]*. Finish shall be resistant to water and mild cleaners.

H. Edgebanding for Thermoset Decorative Overlay (Melamine) finished Panels: PVC or polyester edgebanding in color selected by the [Architect] <or> [Owner's Representative].

2.04 FABRICATION - GENERAL

A. General:

1. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

2. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.

3. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

2.05 FABRICATION – FRAMELESS CABINETS

A. General:

1. Exposed and Semi-exposed Ends; Top and Bottom Rails; and Sub-toe Boards:

a. Not less than ¾" thick solid hardwood, or ¾" plain sliced walnut wood veneer over plywood or Medium Density Fiberboard (MDF), or ¾" thick (or not less than 5/8" thick) thermofused melamine finish over MDF or Industrial hardboard (particle board).

1) Machine ends for wood-dowel or mechanical dowel fasteners to receive top, bottom, and back. Base ends to extend to floor. Finish exposed ends to match doors and doors and drawer fronts.

2. Unexposed Ends: Not less than 3/4-inch hardboard or particle board; finished with Thermoset Decorative Overlay (Melamine). Attach to front frame in same manner as exposed ends.

3. Back Panels:

a. Not less than 1/4-inch tempered hardboard or MDF; finished with Thermoset Decorative Overlay (Melamine).

4. Doors 48 Inches or Less in Height:

a. Flush (Slab) Style Doors: 3/4 inch thick, Plywood, Particle Board or MDF cores, and hardwood face veneers. All doors that are not hardwood to received PVC edgeband.

b. Single Fixed Panel Stile and Rail Style Doors: 3/4 inch thick, with solid hardwood stiles and rails, Particle Board or MDF cores, and hardwood face veneers and crossbands.

c. Provide stop silencers at the top and bottom of all hinged doors.

5. Shelving: Not less than 5/8" industrial hardboard or MDF with Thermoset Decorative Overlay (Melamine) to match cabinet interior, PVC edge banding; adjustable at least every 1-1/2 inch; clear plastic shelf clip pressed into 5mm holes bored in cabinet side. Fabricate base shelf to half depth.

6. Filler Strips:

a. Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

b. Oversize for field cutting to suit field conditions and assure continuous enclosure of open spaces.

c. Provide raw (unfinished) cleats at blind corners and appliance openings as required to support countertops, minimum 3/4-inch x 1-1/2 inch x 8 foot length, to be field cut and fit by the installer

B. Base Cabinet Units:

1. Base Cabinet Top Stretchers:

a. Cabinet stretchers attached horizontally to top of cabinet-side at front and rear to keep cabinet square.

b. At sink cabinet or cooktop cabinet front cabinet stretcher to be mounted vertically to avoid impediment with sink or cooktop appliance.

1) Option:

a) Provide 3/4" thermofused melamine or not less than ½" hardwood plywood corner blocks glued and fastened in each of four top corners to maintain cabinet square and rigid.

b) Or provide Plastic Corner Blocks at four top corners fastened to side panel and front/rear cabinet components.

2. Base Cabinet Toe Space & Kick Board:

a. To be integrated with side panels, capturing toe kick between side panels.

b. Side panels to be notched for integral toe space with side panels extended to floor for continuous support. Finish bottom, side and top edge of side panels with PVC edgebanding to prevent water absorption.

1) Option: Provide mechanical waterproof leg (plastic or metal) attached to bottom of cabinet, toe kick boards attached via clip system from Hafele (or equal).

c. Finish bottom edge of thermofused melamine side panels with PVC edge banding to prevent water absorption.

d. Provide toe board cover not less than 1/4" tempered hardboard or MDF with thermofused melamine face and side top surface to match cabinet doors, or hardwood plywood. Apply after installation to achieve a continuous toe board cover; minimize seams.

e. Seal bottom, side and top edge of toe kick board with PVC edge band to prevent water absorption

3. Drawers:

a. Sides, front, and back: Box-type thermofused melamine construction ¾" (or not less than 5/8"), or hardwood not less than ½", with sub-front and back joined to sides with

glued dovetail, or glued and doweled, or mechanical dowel, or rabbeted into side and secured with glue and mechanical fasteners.

b. Exposed fronts fastened to sub-fronts with adjustable drawer-front mounting system or with mounting screws from interior of body.

c. Bottom: Not less than ½" or 3/8"" hardwood plywood or thermofused melamine on MDF or Industrial hardboard. Drawer box sides and front/back to be grooved to accept bottom panel, bottom panel to be fully inserted into groove to create permanent attachment.

1) Option: drawer sides by "Metabox Drawer System" (or equal) are acceptable.

C. Wall Cabinet Units:

1. Hanging rails: (used when back panel is less than 5/8" thick):

a. Not less than 1/2" x 3" plywood, or not less than 5/8" x 3" Thermofused Melamine, edge banded all exposed edges, and fastened at each end to side panel at top and bottom.

2. Bottom finish:

a. Frameless cabinet box to be finished on underside to match door and end panels.

b. Wherever under-cabinet lighting is called for, recess bottom panel/shelf up into cabinet and provide light valance, to hide light fixture, sandwiched between cabinet side panels. Maintain full overlay of door so light valance is hidden when door is closed. Depth of lighting recess under cabinet to be 1", or deeper if needed, to hide specified under-cabinet lighting fixture. Exposed interior surface of side panel and back panel at lighting recess will show interior cabinet color.

2.06 CABINET HARDWARE

A. See Cabinet Hardware Schedule for list of which Manufacturers are approved for use on a specific item.

B. Avendra, LLC Preferred Manufacturers:

1. None

C. Approved Manufacturers

1. Accuride International (562-903-0200)
2. Blum, Inc. (800-438-6788)
3. CompX Timberline (847-752-2600)
4. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group (800-543-3658)
5. Epco, The Engineered Products Co. (810-767-2050)
6. Franklin Fixtures (508-291-1475)
7. Grass America, Inc. (800-334-3512)
8. Hafele America Co. (800-423-3531)
9. H.B. Ives, an Ingersoll-Rand Company (800-820-5542)
10. Hercules Casters and Wheels (800-942-8717)
11. Hettich America, LP (800-777-1772)
12. J. G. Edelen Company, Inc. (410-918-1200)

13. Knape & Vogt Manufacturing Co. (800-253-1561) (KV)
14. Doug Mockett & Company, Inc. (800-523-1269)
15. Outwater Plastics Industries, Inc. (800-631-8375)
16. Polar Ware Company (800-237-3655)
17. Richelieu America (704-330-0114)
    a. Contact: Architectural Business Development: Michael Baer (704-330-0114)
    b. Contact: Technical Support Resources Manager: Michael Holiday (336-256-9570 x 3511)
18. Rockler Companies, Inc. (800-279-4441)
19. Selby Furniture Hardware Co., Inc. (718-993-3700)
20. Shepherd Caster Corporation (800-253-0868)
21. Stanley Hardware, Div. of the Stanley Works (800-493-5263)
22. Stylmark, Inc. (Garcy Corp.) (800-328-2495)
23. Victory Display & Store Fixture Mfg. (800-262-1126)

D. General: Provide cabinet hardware and accessory materials associated with architectural cabinets. Coordinate finishes of exposed cabinet hardware with adjacent finish hardware as specified in Section 08 71 00.

1. All exposed hardware in Public Spaces to be US15 unless noted otherwise.

E. Cabinet Hardware Schedule:

ITEM	MODEL NO.	MANUFACTURER
FRONT DESK		
Brackets, Interior	187, 171, 173, and 179	K&V
Catch, Elbow	2 (Bronze)	Ives
Catch, Roller	336 (Bronze)	Ives
Drawer Locks		
Drawer Slides	3832	Accuride
Folding Table Brackets	250080 (Zinc)	Stanley
Hinges, Pivot	341	Stanley
Hinges, Continuous (Piano)	311-1/4 x 2-1/2" x 72"	Stanley
Magnetic Catches	323, 326, and 327	Ives
Pulls, Door and Drawer (Refer to Interior Finish Index for locations)	120.61.950 x Tarnished Silver	Hafele
Shelf Supports, Interior	256	K&V
Sliding Door Finger Pulls		
Sliding Door Lock		
Standards, Interior	255, 87, 71, & 80 (Anachrome)	K&V
THE MARKET		
Base Cabinet Legs	637.45.326	Hafele
Toe Kick Panel Clip	637.45.915	Hafele
Concealed Shelf Standard	T-Standard7/16" HB800-7	Victory Store Fixtures
Adjustable Shelf Bracket	179 Anochrome	KV
Shelf Fastener	154 Anochrome	KV

Glass Doors	3/16” Thick Tempered Safety Glass	
Glass Door Hinges (matt chrome)	316.33.300 Type 18	Hafele
Glass Door Hinge Round Trim Cap	316.10.420	Hafele
Cabinet Pulls	115.61.601	Stanley
Cabinet Pulls (Option)	4485 1/2	Stanley
Cabinet Locks	02066	Corbin
Concealed Hinges at upward lifting cabinet doors	Kinvaro T-105	Grass America
Alum. Slatwall	# ALU7584-M	Outwater
Slatwall Hooks	Coordinate with Slatwall manufacturer.	
Condiment Container	2Y Bain Marie (Stain Steel)	Polarware
Metal Shelf (powder coated aluminum)	Flat Metal Shelf	Franklin Fixtures
Concealed Hinges	Nexis 100 Inset Hinge	Grass America

GUESTROOMS & EMPLOYEE LOUNGE
(Refer to Section 12 35 30.13)

F. Exposed Wall Shelving: “No. 80 x No. 182”; Knape & Vogt Manufacturing Co.; inset type, adjustable on 1" centers.

G. Cash Drawer With Lock

1. Furnished by Owner. Contractor shall coordinate size.

a. Provide 1/8” clearance around all four sides, or as recommended by manufacturer.

2.07 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

1. Adhesives: Installation adhesives as recommended by manufacturer for use intended.

2.08 SHOP FINISHING

A. Quality Standard: Comply with AWS Appendix B, unless otherwise indicated.

B. General: Finish casework at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D523:

1. Grade: Custom.

2. Finish System: Finish System -2, pre-catalyzed lacquer.

a. Stain Color: Refer to Interior Finish Index.

b. 1 Coat precatalyzed sanding sealer

c. Sand after curing with 240 Grit

d. 1 Coat colored sealer

e. 1 Coat precatalyzed sealer

f. Sand after curing with 320 Grit

g. 1 Coat precatalyzed lacquer - 30% Sheen (semi-gloss) to match approved sample provided by Marriott.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. All cabinets and shelving shall be installed as shown on Drawings and as specified by manufacturer.

B. Set and secure casework in place rigid, plumb, and level.

C. Cabinets: Install without distortion so 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 installation of hardware and accessory items as indicated.

1. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
2. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Maintain veneer sequence matching of cabinets with transparent finish.
4. Carefully scribe casework which is against other building materials, leaving gaps of 1/32 inch maximum. Do not use additional overly trim for this purpose.
5. Carefully fit equipment to be installed into millwork. Provide filler pieces when required.

D. Fasteners:

1. Use purpose designed fixture attachments at concealed locations for wall-mounted components.
2. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
3. Countersink anchorage devices at exposed locations used to wall-mount components, and conceal with solid plugs of species to match surrounding wood. Finish flush with surrounding surfaces.
4. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.03 ADJUSTING AND CLEANING

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

B. Clean casework, shelves, hardware, fittings and fixtures.

END OF SECTION

SECTION 12 32 16

MANUFACTURED PLASTIC LAMINATE CLAD CASEWORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Custom Cabinet Units
    a. Plastic Laminate Clad Custom Cabinet Units
2. Cabinet Hardware

B. Related Sections:

1. Section 06 61 00 - Rough Carpentry
2. Section 06 20 0 - Finish Carpentry
3. Section 12 32 13 – Manufactured Wood-Veneer-Faced Casework
4. Section 12 35 30.13 – Kitchen Casework
5. Section 12 36 23 - Plastic Countertops
6. Section 12 36 40 - Stone Countertops
7. Section 12 36 61 – Simulated Stone Countertops
8. Section 12 36 61.13 – Cultured Marble Countertops
9. Section 12 36 61.16 – Solid Surfacing Countertops
10. Section 12 36 63 – Ultracompact Surfacing Countertops
11. Division 22 for Plumbing Fixtures

1.02 REFERENCES

A. Architectural Woodwork Institute (AWI) / Architectural Woodwork Manufacturers Association of Canada (AWMAC) /Woodwork Institute (WI) Publications:

1. "Architectural Woodwork Standards (AWS)"

B. ASTM International (ASTM) Publications:

1. C1048 “Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass”
2. D523 “Standard Test Method for Specular Gloss”
3. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

C. American National Standards Institute (ANSI) Publications:

1. A135.4 Basic Hardboard
2. ANSI/KCMA A161.1 “Performance and Construction Standard for Kitchen and Vanity Cabinets
3. A161.2 “Standards for Fabricated High Pressure Decorative Laminate Countertops”
4. A208.1 "Standards for the Performance of Particleboard"

D. *[DW1]*National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. NEMA LD3 “High Pressure Decorative Laminates”
    a. Grade HGS (GP 50): Horizontal grade
    b. Grade VGS (GP-28): Vertical Grade
    c. Grade CLS (CL 20): Cabinet liner
    d. Grade BKL (BK 20): Backing sheet
    e. Grade HGF (FR 50): Horizontal application, fire retardant material

f. Grade VGF (FR 32): Vertical application, fire retardant material

1.03 *[DW2]*SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

a. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

b. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.

C. Qualification Data: For Fabricator

1.04 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 PROJECT CONDITIONS

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

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

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. MillRock RiverRun Casework (540-438-5973)
2. R.B. Woodcraft, Inc. (315-474-2429)
3. J. Suss Industries Inc. (866-769-5666)

2.02 PLASTIC LAMINATE CUSTOM BOX CABINET UNITS

A. Quality Standard:

1. Perform work to meet the requirements of Custom Grade in accordance with the "Architectural Woodwork Standards (AWS)", unless noted otherwise manufactured from solid stock meeting the following requirements:

a. Minor warp which can be held flat and straight with normal nailing.

b. Natural and manufacturing defects in excess of those permitted in the grade specified are permitted if such defects are to be covered by adjoining members or otherwise concealed.

c. Trim members for application on flat surfaces shall have the reverse side "backed out", except members with exposed ends.

B. Design:

1. Style of face construction for base, wall, and full-height units, if any, with drawer fronts, doors, and fixed panels as follows:

a. Face Frame or Frameless.

1) All cabinets shall be the same construction type for the entire Project.

b. Cabinet and Door Interface:

1) Cabinet and Door Interface: Flush (Full) Overlay.

2) Flush Panel Doors.

3) Flush Panel Drawer Fronts.

2. Grain Direction:

a. Vertical on doors, horizontal on drawer fronts.

b. Lengthwise on face frame members.

c. Vertical on end panels.

d. Side to side on bottoms and tops of units.

e. Vertical on knee-space panels.

f. Horizontal on aprons.

2.03 MATERIALS

A. Lumber shall be in accordance with the AWS Grade specified for the product being fabricated. Moisture content shall be 6% to 12% for boards up to 2-inches nominal thickness, and shall not exceed 19% for thicker pieces.

B. Plastic Laminate: Shall be high-pressure decorative laminate material complying with current NEMA Standard LD-3. Comply with ANSI A161.2. Pattern and color shown on Interior Finish Index.

1. Laminate Manufacturers:

a. Avendra, LLC Preferred Manufacturers:

1) None

b. Approved Manufacturers:

1) Formica Corporation (800-367-6422)

2) WilsonArt International, Inc. (800-433-3222)

3) Lamin-Art (800-323-7624)

4) Nevamar Company, LLC (800-638-4380)

5) Pionite Decorative Surfaces, a Panolam Industries International Incorporated Company (800-746-6483)

6) "Abet Laminati"; ABET Inc. (800-228-2238)

C. Particle Board: ANSI A208.1, Mat-Formed Particle Board, Grade 1-M-2, with minimum density of 45 pcf. Internal bond of 60 psi, and minimum screw holding capacity of 225 lb. on faces and 200 lb. on edges.

D. Hardboard: ANSI A135.4, Class 1, tempered.

E. MDF: ANSI A208.2, Grade 130.

F. Thermoset Decorative Overlay (Melamine): Not less than 100 gram thermally fused, melamine-impregnated decorative paper, complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10. Finish shall be resistant to water and mild cleaners.

G. Edge banding for use Thermoset Decorative Overlay (Melamine) finished Panels: PVC or polyester edge banding matching thermoset decorative overlay.

2.04 FABRICATION - GENERAL

A. General:

1. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
2. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.
3. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

2.05 FABRICATION – FRAMELESS CABINETS

A. General:

1. Exposed Ends: Grade VGS plastic laminate or minimum 0.030-inch thick PVC edge banding. Color to match exposed faces.
2. Semi-exposed Ends; Grade VGS plastic laminate or minimum 0.030-inch thick PVC edge banding. Color to match exposed faces.
3. Top and Bottom Rails; and Sub-toe Boards:
   a. Not less than 3/4-inch particleboard faced with Grade VGS plastic laminate to match door and drawer fronts. Machine ends for wood-dowel or mechanical dowel fasteners to receive top, bottom, and back. Base ends to extend to floor. Finish exposed ends to match doors and doors and drawer fronts.
4. Unexposed Ends: Not less than 3/4-inch tempered hardboard; finished with Thermoset Decorative Overlay (Melamine). Attach to front frame in same manner as exposed ends.
5. Back Panels:
   a. Not less than 1/4-inch tempered hardboard or MDF; finished with Thermoset Decorative Overlay (Melamine).
6. Doors 48 Inches or Less in Height: 3/4 inch thick, Particle Board cores. Front faces to be Grade VGS plastic laminate overlay, and back faces to be Thermoset Decorative Overlay (melamine). Provide stop silencers at the top and bottom of all hinged doors.
7. Shelving: Not less than 5/8" particle board with Thermoset Decorative Overlay (melamine) to match cabinet interior, PVC edge banding; adjustable at least every 1-1/2 inch; clear plastic] shelf clip pressed into 5mm holes bored in cabinet side. Fabricate base shelf to half depth.
8. Filler Strips:
   a. Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.
   b. Oversize for field cutting to suit field conditions and assure continuous enclosure of open spaces.
   c. Provide raw (unfinished) cleats at blind corners and appliance openings as required to support countertops, minimum 3/4-inch x 1-1/2 inch x 8 foot length, to be field cut and fit by the installer
9. Interior Cabinet Finish:
   a. Public Space Casework: Interior face of exposed units shall be Medium Wood Grain Thermoset Decorative Overlay (melamine).

b. Public Space Casework Wet Areas: Interior unexposed face of units that are likely to become wet (such as cabinets housing refrigerated cold pans) should be constructed of polyester overlaid plywood cabinet liner materials:

1) Approved Manufacturer: "Cabinet Liner Industrial Panel"; Olympic Panel Products, LLC (800-782-7265), or approved substitution.

c. Back-of-House Casework: Interior face of exposed units shall be Medium Wood Grain Thermoset Decorative Overlay (melamine).

B. Base Cabinet Units:

1. Base Cabinet Top Frames: 3/4-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.

2. Base Cabinet Stretchers: 3/4-by-4-1/2-inch plywood, Particle Board, or MDF strips or solid-wood boards at front and back of cabinet, glued and pinned or screwed.

a. Base Cabinet Stretchers may be provided as an option to base cabinet top frames.

3. Bottoms: Not less than 1/2-inch hardwood plywood faced with Thermoset Decorative Overlay (Melamine) to match door and drawer fronts, fully supported by and secured in rabbets in end panels, front frame, and back bottom rail.

4. Corner Blocks: Glued and fastened in each of four top corners to maintain cabinet squareness and rigidity.

5. Drawers:

a. Provide box-type construction with sub-front and back joined with glued dovetail or rabbeted into sides and secured with glue and mechanical fasteners. Clear coat all exposed surfaces. Match color of sides and bottoms with drawer fronts.

b. Drawer Fronts: 3/4 inch thick, Particle Board cores. Front faces to be Grade VGS plastic laminate overlay, and back faces to be Thermoset Decorative Overlay (melamine).

c. Drawer Sides Sub-fronts, and Backs: Not less than 1/2-inch hardwood dovetail construction or 3/4-inch thick Particle Board faced with Thermoset Decorative Overlay (melamine). Provide PVC edge banding to match finish of fronts.

d. Exposed fronts fastened to Sub-fronts with mounting screws from interior of body.

e. Drawer bottom of not less than 1/4-inch thick plywood faced with Thermoset Decorative Panel overlay (melamine), set into rabbets in back, sides, and sub-fronts.

C. Wall Cabinet Units:

1. Tops and Bottoms: Not less than 1/2-inch hardwood plywood faced with Thermoset Decorative Overlay (Melamine) to match door and drawer fronts, fully supported by and secured in rabbets in end panels, front frame, and back rail.

2.06 CABINET HARDWARE

A. See Cabinet Hardware Schedule for list of which manufacturers are approved for use on a specific item.

B. Avendra, LLC Preferred Manufacturers:

1. None

C. Approved Manufacturers:

1. Accuride International (562-903-0200)
2. Blum, Inc. (800-438-6788)
3. CompX Timberline (847-752-2600)
4. Corbin Russwin Architectural Hardware, an ASSA ABLOY Group (800-543-3658)
5. Epco, The Engineered Products Co. (810-767-2050)

6. Franklin Fixtures (508-291-1475)
7. Grass America, Inc. (800-334-3512)
8. Hafele America Co. (800-423-3531)
9. H.B. Ives, an Ingersoll-Rand Company (800-820-5542)
10. Hercules Casters and Wheels (800-942-8717)
11. Hettich America, LP (800-777-1772)
12. J. G. Edelen Company, Inc. (410-918-1200)
13. Knape & Vogt Manufacturing Co. (800-253-1561) (KV)
14. Doug Mockett & Company, Inc. (800-523-1269)
15. Outwater Plastics Industries, Inc. (800-631-8375)
16. Polar Ware Company (800-237-3655)
17. Richelieu America (704-330-0114)
    a. Contact: Architectural Business Development: Michael Baer (704-330-0114)
    b. Contact: Technical Support Resources Manager: Michael Holiday (336-256-9570 x 3511)
18. Rockler Companies, Inc. (800-279-4441)Selby Furniture Hardware Co., Inc. (718-993-3700)
19. Shepherd Caster Corporation (800-253-0868)
20. Stanley Hardware, Div. of the Stanley Works (800-493-5263)
21. Stylmark, Inc. (Garcy Corp.) (800-328-2495)
22. Victory Display & Store Fixture Mfg. (800-262-1126)

D. General: Provide cabinet hardware and accessory materials associated with architectural cabinets. Coordinate finishes of exposed cabinet hardware with adjacent finish hardware as specified in Section 08 71 00.

E. Cabinet Hardware Schedule:
1. Refer to Section 12 32 13 – Manufactured Wood Veneer Faced Casework for public areas and back-of-house cabinet hardware.
2. Refer to Section 12 35 30.13 – Kitchen Casework for guestroom and employee lounge cabinet hardware.

F. Exposed Wall Shelving Hardware: "No. 80 x No. 182"; Knape & Vogt Manufacturing Co.; inset type, adjustable on 1" centers.

G. Cash Drawer With Lock
1. Furnished by Owner. Contractor shall coordinate size.
    a. Provide 1/8" clearance around all four sides, or as recommended by manufacturer.

2.07 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
1. Adhesives: Installation adhesives as recommended by manufacturer for use intended.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. All cabinets and shelving shall be installed as shown on Drawings and as specified by manufacturer.

B. Set and secure casework in place rigid, plumb, and level.

C. Cabinets: Install without distortion so 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 installation of hardware and accessory items as indicated.

1. Secure cabinet and counter bases to floor using appropriate angles and anchorages.
2. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Maintain veneer sequence matching of cabinets with transparent finish.
4. Carefully scribe casework which is against other building materials, leaving gaps of 1/32 inch maximum. Do not use additional overly trim for this purpose.
5. Carefully fit equipment to be installed into millwork. Provide filler pieces when required.

D. Fasteners:

1. Use purpose designed fixture attachments at concealed locations for wall-mounted components.
2. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
3. Countersink anchorage devices at exposed locations used to wall-mount components, and conceal with solid plugs of species to match surrounding wood. Finish flush with surrounding surfaces.
4. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.03 ADJUSTING AND CLEANING

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

B. Clean casework, shelves, hardware, fittings and fixtures.

END OF SECTION

SECTION 12 36 16

METAL COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Metal Laminated to Wood Core

a. Countertops and Backsplashes

b. Aprons

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry
2. Section 06 20 00 (06200) - Finish Carpentry
3. Section 06 61 13 (06610) – Cultured Marble Fabrications
4. Section 11 40 00 (11400) – Food Service Equipment: For all Countertops related to Food Service Equipment
5. Section 11 31 00 (11450) – Residential Appliances
6. Section 12 30 00 (06400) - Architectural Woodwork
7. Section 12 36 23 (06415) – Plastic Countertops
8. Section 12 36 40 (09380) - Stone Countertops
9. Section 12 36 61 (09385) - Engineered Stone Countertops
10. Section 12 36 61.13 (09385) – Cultured Marble Countertops
11. Division 23 (15) Sections: Plumbing Fixtures and Equipment
12. Division 26 (16) Sections: Basic Electrical Materials and Methods

1.02 REFERENCES

A. Code of Federal Regulations (CFR) Publications:

1. 40 CFR, Part 59, Subpart D 2001, "National Volatile Organic Compound Emission Standards for Architectural Coatings"

B. American National Standards Institute (ANSI) Publications:

1. A208.1 Mat-Formed Wood Particleboard

C. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. A240/A 240M “Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications”
2. A666 “Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar”
3. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

D. Architectural Woodwork Institute (AWI) Publications:

1. "Architectural Woodwork Quality Standards"

1.03 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) with the following supporting data:

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

2. Submit samples of metal finishes, including fabricated, welded, and finished corner.

1.04 QUALITY ASSURANCE

A. All work and materials in full accordance with the latest rules of U.S. Public Health Service, and local or state ordinances.

B. Wood Substrate Fabrication and Installation: Perform work to (custom) quality in accordance with "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute AWI.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 PROJECT CONDITIONS

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

B. Field Measurements: Where countertop work 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 countertops by field measurements before being enclosed and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.01 MATERIALS

A. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness, minimum 0.050-inch thick (18 gauge).

B. Filler Materials and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items.

1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

C. Particleboard Core:

1. ANSI A208.1, Grade M-2.

2. Wood Glue: Waterproof types as recommended by AWI standards for the particular application.

3. Laminating Adhesive: Compatible with substrate; heat resistant and noncombustible after curing, as recommended by adhesive manufacturer for materials being joined.

a. For adhesives used on-site comply with the following:

1) Contact Adhesive: VOC content of not more than 80 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

2) Metal-to-metal Adhesive: VOC content of not more than 30 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

3) Special-Purpose Contact Adhesive (contact adhesive used to bond melamine-covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, and rubber or wood veneer, 1/16 inch or less in thickness, to any surface): 250 g/L.

2.02 COUNTERTOPS

A. Stainless Steel Countertops: Formed with integral edges and backsplashes of stainless steel sheet in minimum thickness indicated with fully welded, ground smooth and blended joints, laminated after fabrication to core material.

1. Stainless Steel Finish: No. 4, with grain pattern running in long direction of item.

2. Welding: Weld seams and joints continuously. Control welding processes and temperatures to avoid metal discoloration. Grind joints smooth and blend metal surface finish to match adjoining surfaces.

3. Countertop Cores: Laminated [particleboard] [Fire-retardant particle board] of thickness required, but not less than indicated, fabricated to completely support underside of stainless steel surfaces.

2.03 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.04 FABRICATION

A. General:

1. Shop-fabricate and assemble countertops in one piece. Fabricate based on templates and field measurements to fit tightly to adjoining construction.

2. When necessary to cut and fit on site, provide materials with ample allowance for cutting and scribing. Provide trip by fabricator for on-site scribing, cutting, and finish repairs as required.

3. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

4. Finish all metal edges to a uniform radius. Roll and hem unsupported edges.

5. Provide finished cutouts with fabricated, fully returned and hemmed metal edging for trash cutouts.

6. Provide protective coating where required to prevent electrolysis between dissimilar metals.

7. Provide temporary surface film protection following fabrication of all finished metal surfaces.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. All countertops and shelving shall be installed as shown on Drawings and as specified by manufacturer.

B. Set and secure countertops in place rigid, plumb, and level.

C. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

D. Fasteners:

1. Use purpose designed fixture attachments at concealed locations for wall-mounted components.

2. Use threaded steel concealed joint fasteners to align and secure adjoining counter tops.

3. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.03 ADJUSTING AND CLEANING

A. Verify that installed countertops are free from surface blemishes, and scratches, that metal surfaces remain fully bonded to supporting substrates, and that supporting substrates are not damaged from handling, installation, or exposure to excessive amounts of moisture. Perform minor repairs and touch-up damaged finishes that can be adequately performed in the field. Return damaged metal countertops to fabricator for repair or replacement if damaged product cannot be repaired to a like new and undamaged condition in the field.

B. Remove surface protection films and clean surfaces using non-petroleum based cleaning products recommended by fabricators of metal surfaces. Protect surfaces until substantial completion.

END OF SECTION

SECTION 12 36 23

PLASTIC COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plastic Laminate
    a. Countertops and Backsplashes
    b. Aprons

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry
2. Section 06 20 00 (06200) - Finish Carpentry
3. Section 06 61 13 (06610) – Cultured Marble Fabrications
4. Section 12 30 00 (06400) - Architectural Woodwork
5. Section 12 36 40 (09380) - Stone Countertops
6. Section 12 36 61 (09385) - Engineered Stone Countertops
7. Section 12 36 61.13 (09385) – Cultured Marble Countertops

1.02 REFERENCES

A. American National Standards Institute (ANSI) Publications:

1. A161.2 “Performance Standards for Fabricated High Pressure Decorative Laminate Countertops”
2. A208.1 “Particleboard”

B. ASTM International (ASTM) Publications:

1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

C. Federal Specifications (FS) Publications:

1. MM-L-736 “Lumber, Hardwood”
2. MMM-A-130 “Adhesive, Contact”

D. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. LD3 “High Pressure Decorative Laminates”

E. National Institute of Standards and Technology (NIST)

1. PS 1 “Construction and Industrial Plywood”
2. PS 20 “American Softwood Lumber Standard”
3. PS 51 “Hardwood and Decorative Plywood”
4. PS 58 “Basic Hardboard”

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

1.04 QUALITY ASSURANCE

A. Perform work to (custom) quality in accordance with "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute AWI

B. Plastic Laminate Materials shall comply with NEMA LD-3 as follows:

1. GP 50: Horizontal grade
2. CL 20: Cabinet liner
3. BK 20: Backing sheet
4. PF-40: Post Forming Grade
5. FR 50: Horizontal application, fire retardant material
6. FR 32: Vertical application, fire retardant material

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 PROJECT CONDITIONS

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

B. Field Measurements: Where countertop work 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 countertops by field measurements before being enclosed and indicate measurements on Shop Drawings.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Plastic Laminate: Shall be standard grade, 1/16" thick, general purpose material complying with current NEMA LD-3 Grade HGS for flat countertops [and HGP for postformed]. Comply with ANSI A161.2. Pattern and color shown in [Interior Finish Index].

1. Approved Manufacturers:

a. Lamin-Art (800-323-7624)

b. Nevamar Company, LLC (800-638-4380)

c. Pionite Decorative Surfaces, a Panolam Industries International Incorporated Company (800-746-6483)

d. Formica Corporation (800-367-6422)

e. WilsonArt International, Inc. (800-433-3222)

B. Particleboard Core:

1. ANSI A208.1, Grade M-2.

C. Adhesives:

1. Wood Glue: Waterproof types as recommended by AWI standards for the particular application.

2. Plastic Laminate: Non-Flammable Type:

a. Approved Manufacturers:

1) "DAP Weld-Wood, Non-Flammable Type" - DAP, Inc. (888-327-8477)

2) Approved substitution.

3. Installation adhesives as recommended by manufacturer for use intended.

2.02 COUNTERTOPS

A. Countertops and Edging: [3/4" B-C particleboard (except at sinks, use exterior grade plywood only)] with plastic laminate bonded to tops.

1. In locations as required by local codes or ordinances, provide fire retardant countertop assemblies, as tested in accordance with ASTM E 84.

B. Plastic Laminate Work:

1. Where shown as self edged, countertops shall have 3/4" x 4" high square-edged separate matching backsplash and matching aprons with same grade of laminate as top surface unless indicated otherwise.

a. Apply trim and edging prior to surface sheet.

b. Apply veneers or plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Make corners and joints hairline. Locate counter butt joints minimum 2 feet from sink cut-outs.

2. Counters and work tops with sinks: Substrate for back splashes and at edges shall be trimmed lumber. Use only exterior grade or marine grade Plywood near wet areas. All adhesives used near water shall be formulated to be specially water-resistant.

C. ADA Accessible Guest Room:

1. Meet all local and national requirements for access. Minimum work surface shall be as follows:

a. Sink Area: Minimum 28" to 34" maximum above finished floor x 30" in length.

b. Countertop: Minimum 28" to 34" maximum above finished floor x 30" in length.

2. For units which have exposed sides and ends due to placement of accessible units, provide durable, nonabsorbent materials for finish.

3. Provide wall brackets and standards of the type capable of loads of 250 pounds per linear foot of horizontal work surface.

4. Provide brackets capable of supporting work surfaces and loads without leading edge deflection greater than 1/2".

2.03 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.04 FABRICATION

A. General:

1. Shop assemble countertops for delivery to site in units easily handled and to permit passage through building openings.

2. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.

3. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

A. All countertops and shelving shall be installed as shown on Drawings and as specified by manufacturer.

B. Set and secure countertops in place rigid, plumb, and level.

C. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

D. Fasteners:

1. Use purpose designed fixture attachments at concealed locations for wall-mounted components.

2. Use threaded steel concealed joint fasteners to align and secure adjoining counter tops.

3. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.03 PLASTIC LAMINATE

A. Installation:

1. The plastic laminate shall be bonded to a suitable substrate. Rigid setting type adhesive is recommended. The temperature of the materials, surfacing, substrate, and adhesive, and the area in which the actual fabrication is to be done shall not be less than 65 degrees F. with a relative humidity of not less than 35% and not more than 85%. All inside

corners of cutouts in plastic laminate shall be radiused as large as possible with 1/8"R minimum. File edges of the radius smooth and free of cracks and crazes.

B. Method:

1. Assembly of components should be accomplished using approved procedures, materials, and equipment, and the workmanship should conform to established industry practices, conditions, procedures, and recommendations.

C. Use single sheet at corners. Seams will not be permitted at corners, unless otherwise approved by Owner's Representative].

D. Arrange joints in vertical edges away from common view.

3.04 ADJUSTING AND CLEANING

A. Clean surfaces of plastic laminate with a damp cloth or ordinary bar soap and water. Harsh abrasive cleansers shall not be used. Stubborn dirt may be removed with lacquer thinner, methlethyl Ketone, contact adhesive solvents or cleaner waxes.

END OF SECTION

SECTION 12 36 40

STONE COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior Granite
    a. Vanity Tops
    b. Countertops
    c. Backsplashes
    d. Aprons
    e. Tub Seat
    f. Casework Faces (Vertical)
    g. Credenza Tops
    h. Accent / Border Tile
    i. Wall Base

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry
2. Section 06 20 00 (06200) - Finish Carpentry
3. Section 07 92 00 (07920) - Joint Sealants
4. Section 09 30 00 (09310) - Tiling
5. Section 12 32 13 (06400) - Manufactured Wood-Veneer-Faced Casework
6. Section 12 32 16 (06400) - Manufactured Plastic Laminate Clad Casework
7. Section 12 36 23 (06415) – Plastic Countertops
8. Section 12 36 61 (09385) - Simulated Stone Countertops
9. Section 12 36 61.13 (09385) – Cultured Marble Countertops
10. Division 22 (15) for Plumbing Fixtures

1.02 REFERENCES

A. ASTM International (ASTM) Publications:

1. C503 “Standard Specification for Marble Dimension Stone (Exterior)”
2. C615 “Standard Specification for Granite Dimension Stone”

B. American National Standards Institute (ANSI) Publications.

1. A118.3 “water-cleanable, tile-setting epoxy adhesive”

C. Marble Institute of America (MIA) Publications:

1. "Dimension Stone Design Manual"

D. National Building Granite Quarries Association's (NBGQA) Publications:

1. "Specifications for Architectural Granite"

1.03 SYSTEM DESCRIPTION

A. MARRIOTT STONE SUPPLIER PROGRAM: Marriott International has negotiated a strategic national pricing/delivery commitment agreement with the listed Program Suppliers.

1. Participating Program Suppliers require the following procedures in order to meet the core criteria of lead time, pricing and quality:

a. General Contractor shall allow a minimum delivery lead time of [8 to 10] weeks after final approval of Shop Drawings and Samples.

b. In order for the Project to procure strategic national pricing, the award of the contract to the Program Supplier must be completed a minimum of [12] week prior to delivery of products.

2. Participating Program Suppliers shall:

a. Supply all stone items for Guestroom Sample Room. Program Suppliers shall coordinate with the General Contractor to allow for appropriate time period in Construction Schedule.

1) Refer to Section 01 11 00 “Summary of Work” for Sample Room Requirements.

b. Furnish a minimum of three percent (3%) of additional stone material to account for damaged materials during shipment.

c. State the following in their bids:

1) If plywood subtops are included, or not included.

2) If their bid includes field measurements, or not included.

3) If their bid includes sealer pre-applied to stone.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Product data for each type of stone, stonework accessory, and other manufactured products required.

2. Shop Drawings detailing fabrication and installation of stone. Include cutting and setting Drawings indicating sizes, dimensions, sections, and profiles of stones, arrangement and provisions for jointing, supporting, anchoring, and bonding stonework, and details showing relationship with, attachment to, and reception of related work.

a. Include large-scale details of decorative surfaces and inscriptions.

3. Samples for verification purposes of stone in form of sets for each color, grade, finish, type, and variety of stone required and consisting of stones not less than 12 inches square. Include two or more stones in each set of samples showing the full range of variations in appearance characteristics to be expected in completed work.

4. Maintenance Data: For stone tile to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility for Stone: Obtain each color, grade, finish, type, and variety of stone from a supplier with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to cut and finish material without delaying the progress of the work.

B. Single-Source Responsibility for Other Materials: Obtain each type of stone accessory, sealant, and other materials from one manufacturer for each product.

C. Installer Qualifications; Engage an experienced installer who have completed stone countertops similar in material, design, and extent to that indicated for project that has resulted in construction with a record of successful in-service performance.

D. The Contractor is responsible for verification of delivered stone materials for quantities, defects, or damage within [ten (10) days] after delivery. No compensation will be allowed to the contractor for materials and labor that may be required to replace materials after this time period.

E. Allowable Tolerances:

1. Variation in component size: +/- 1/8 inch in 8 feet.

2. Maximum height of abrupt irregularities: 1/32 inch.

3. Location of openings: +/- 1/8 inch from indicated location.

F. Granite materials shall not contain unsafe levels of radioactive materials.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Deliver materials to project site in undamaged condition.

C. Store and handle stone and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or other causes.

1. Do not use pinch or wrecking bars.

2. Lift with wide-belt-type slings where possible. Do not use wire rope or ropes containing tar or other substances that might cause staining. If required to move stone, use wood rollers with cushions at end of wood slides.

3. Store stone on wood skids or pallets covered with nonstaining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones.

4. Protect stored stone from weather with waterproof, nonstaining covers or enclosures, but allow air to circulate around stones.

5. Store cementitious materials off the ground, under cover, and in dry location.

D. General Contractor is responsible for theft or damage to stored materials. Exercise care to prevent damage during delivery, handling and storage.

1.07 PROJECT CONDITIONS

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

1. Maintain ambient temperature between 50 and 95 degrees F for 48 hours before, during and for minimum 7 days after installation.

B. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

1. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating countertops without field measurements. Provide allowance for trimming at site and coordinate construction to ensure actual dimensions correspond to established dimensions.

1.08 SPECIAL WARRANTY

A. Stone:

1. Provide minimum One (1) year Warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Comply with referenced standards and other requirements indicated applicable to each type of material required.

B. Provide matched slabs, coordinated for each type, variety, color, and quality of stone required.

C. The use of colored tints, dyes, or waxes applied to stone shall NOT be permitted

2.02 GRANITE

A. Granite Building Stone Standard: ASTM C615, free from cracks, chips, stains, or other defects, uniform in tone and coloring.

B. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Marriott Stone Supplier Program Manufacturers:

a. Granite Tech, Inc. (610-274-1494)

1) Contact: Bill Skalish (610-274-1494)

b. Belstone, a ProjectStone Company (877-667-8663)

1) Contact: Scott Smith (818-373-4900)

2) Contact: Jacqui Ford (240-423-2296)

c. J.G. Edelen Company, Inc. (410-918-1200)

1) Contact: Dino Arcuri (570-650-0196)

2) Contact: Kelly Smith (410-918-1200)

d. Mgroup (Mstone) (866-342-0001)

1) Contact: Drew Murray (706-837-0008)

3. Materials, Finish and Color: Refer to Interior Finish Index.

2.03 MARBLE

A. Marble Building Stone Standard: ASTM C503, free from cracks, chips, stains, or other defects, uniform in tone and coloring.

B. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Marriott Stone Supplier Program Manufacturers:

a. Granite Tech, Inc. (610-274-1494)

1) Contact: Bill Skalish (610-274-1494)

b. Belstone, a ProjectStone Company (877-667-8663)

1) Contact: Scott Smith (818-373-4900)

2) Contact: Jacqui Ford (240-423-2296)

c. J.G. Edelen Company, Inc. (410-918-1200)

1) Contact: Dino Arcuri (570-650-0196)

2) Contact: Kelly Smith (410-918-1200)

d. Mgroup (Mstone) (866-342-0001)

1) Contact: Drew Murray (706-837-0008)

3. Materials, Finish and Color: Refer to Interior Finish Index.

2.04 ADHESIVES, SEALANTS AND SEALERS

A. Stone Seam Adhesive: 2-part, epoxy or polyester stone adhesive formulated specifically for bonding stone to stone, with an initial set time of not more than 2 hours at 70 deg F.

1. Water-cleanable Epoxy Adhesive: ANSI A118.3, water-cleanable, tile-setting epoxy adhesive.

2. Color: [Clear]

B. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. Inno Chem LLC, Member of Akemi Group (877-462-5364).

1) Epoxy Adhesive: "Akepox”

2) Polyester Adhesive: "Platinum Clear Polyester Adhesive”

b. Approved Substitution by Laticrete International Inc. (800-243-4788)

c. Approved Substitution by Custom Building Products (800-272-8786)

2.05 STONE SEALANTS

A. Sealant for Countertops: Clear silicone sealant complying with requirements of Section 07 92 00 "Joint Sealants".

2.06 STONE SEALERS

A. Penetrating Sealer: Penetrating sealer that protects the exposed faces of stone and grout from staining. Sealer shall be UV transparent; non-yellowing; VOC compliant; mold and mildew resistant; and USDA approved as safe on food handling surfaces. Material shall exceed ADA standards for slip resistance at traffic areas.

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. "511 Porous Plus"; Miracle Sealants Company (800-350-1901)

1) VOC: 737 g/L

b. "DuPont StoneTech Professional BulletProof Stone Sealer"; DuPont (877-786-6383)

1) VOC: <400 g/L

2.07 STONE COUNTERTOP FABRICATION

A. General: Fabricate stone countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and approved Shop Drawings.

1. Granite: Comply with recommendations in NBGQA's "Specifications for Architectural Granite".

2. Marble: Comply with recommendations in MIA's "Dimension Stone – Design Manual VI".

B. Thickness: Provide thickness indicated, but not less than the following:

1. Countertop: [3/4inch[es]

2. Back and End Splashes: 3/4 inch, unless shown otherwise.

3. Thresholds: Fabricate to size and profile as indicated or required to provide transition between adjacent floor finishes.

4. Refer to Drawings and Interior Finish Index for additional requirements.

C. Edge Detail:

1. Countertops:

a. As Shown on Interior Finish Index]

2. Thresholds:

a. Bevel edges of thresholds at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

D. Seams: Fabricate countertops without seams, if seams are required, fabricate sections indicated for joining in field, with seams as follows:

1. Bonded Seams: 1/32 inch or less in width.

E. Cutouts and Holes for Lavatories, Sinks, and Fittings:

1. Undercounter Lavatories: Make cutouts for undercounter lavatories in shop using template or pattern furnished by lavatory manufacturer. Form cutouts to smooth, even curves with edges at right angles to top. Ease juncture of cutout edges with tops, and finish edges to match tops.

2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

F. Labeling:

1. Label of the manufacturers name shall be permanently stamped on the underside of all countertops (engineered quartz, granite, milk glass, etc.) at least approximately every foot or so in run (or one direction) an at least every 2'-0" apart in the opposite direction. The intent is to guarantee that the label will appear on every top no matter how large or small in an accessible/readable location. As long as that is accomplished the guideline for measurements above is flexible.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive stone materials, and conditions under which stonework will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stonework. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify adequacy of backing and support framing.

3.02 PREPARATION

A. Advise installers of other work about specific requirements relating to placement of inserts, flashing reglets, and similar items to be used by stonework installer for anchoring, supporting, and flashing of dimension stonework. Furnish installers of other work with Drawings or templates showing locations of these items.

B. Clean stone surfaces that have become dirty or stained prior to setting to remove soil, stains, and foreign materials. Clean stones by thoroughly scrubbing stones with fiber brushes followed by clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives. Allow stone to dry before installing.

3.03 INSTALLATION - COUNTERTOPS

A. General: Install countertops, except for vanities, over plywood subtops with a full spread of water-cleanable epoxy adhesive.

B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

1. Tops:

a. Flat and true to within 1/8" of a flat surface over a 10' length.

b. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.

C. Fit countertops around projections and to adjacent construction. Smooth and clean field cut edges. Ensure that trim will completely cover cut edges.

D. Bond seams with stone seam adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to seams to prevent adhesive smears. Use clamps to ensure countertop units are properly aligned and seams are minimum width.

E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts while cutting to prevent damage.

F. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.

G. Apply sealant to seams and to gap between countertops and splashes; comply with Section 07 92 00 (07920) "Joint Sealants."

3.04 ADJUSTING AND CLEANING

A. Remove and replace or repair stonework of the following description:

1. Broken, chipped, stained, or otherwise damaged stones. Broken, chipped, stained, or otherwise damaged stone may be repaired, providing the methods and results are acceptable to Owner's Representative.

2. Defective joints.

3. Stones and joints not matching approved samples.

4. Stonework not complying with other requirements indicated.

B. Replace in manner that results in stonework matching approved samples and field-constructed mock-ups, complying with other requirements, and showing no evidence of replacement.

C. Clean stone countertops not less than six days after completion of work, using clean water and stiff 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 stone.

3.05 SEALER APPLICATION

A. All surfaces must be clean and free from all loose grit and debris, satins, dirt, and wax coatings. Surfaces shall remain dry for a minimum of 24 hours before the application of sealer and remain dry for 24 hours after the application of sealer.

B. Floor surface temperature must be above 50° F. and below 90° F.

C. Test on a small area before using to determine if the product is acceptable with type of stone.

D. Two (2) uniform coatings of sealer shall be applied before or after installation of stone materials. If prior to installation, adequate documentation shall be included with the material confirming it has been sealed. If after installation, install in strict accordance with Sealer manufacturer's recommendations.

3.06 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer ensuring dimension stonework being without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 12 36 61.13

CULTURED MARBLE COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast Polymer

a. Window Stools (Interior Sills)

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry
2. Section 06 20 00 (06200) - Finish Carpentry
3. Section 06 61 13 (06610) – Cultured Marble Fabrications
4. Section 12 30 00 (06400) - Architectural Woodwork
5. Section 12 36 23 (06415) – Plastic Countertops
6. Section 12 36 40 (09380) - Stone Countertops
7. Section 12 36 61 (09385) - Engineered Stone Countertops

1.02 REFERENCES

A. Federal Specifications (FS) Publications:

1. FS MMM-A-130 - Adhesive, Contact

B. Architectural Woodwork Institute (AWI) Publications:

1. "Architectural Woodwork Quality Standards"

C. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

a. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.04 QUALITY ASSURANCE

A. Tub/Shower surrounds, window stools and lavatory/vanity countertops shall be supplied by one manufacturer. Where shown to be the same color, the color of the components shall match for all items. Refer to Interior Finish Index for colors.

B. Allowable Tolerances:

1. Variation in component size: +/- 1/8 inch.

2. Location of openings: +/- 1/8 inch from indicated location.

C. Perform work to (custom) quality in accordance with "Quality Standards" of the Architectural Woodwork Institute (AWI).

D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 PROJECT CONDITIONS

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

B. Field Measurements: Where cast polymer materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cast polymer materials work by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.07 SPECIAL WARRANTY

A. Cast polymer materials:

1. Provide one (1) year Warranty against manufacturing defects.

PART 2 PRODUCTS

2.01 CAST POLYMER:

A. Manufacturers:

1. Avendra, LLC Preferred Manufacturers:

a. Window Stools:

1) None.

2. Approved Manufacturers:

a. Window Stools:

1) Mincey Marble Manufacturing Co. (800-533-1806)

2) MPL Corporation (317-835-9000)

B. Fire Hazard Ratings:

1. Classified in accordance local codes and ordinances, ASTM E84 and the following:

a. Class [A]

b. Flame Spread: [Class A: 0 - 25]

c. Smoke Developed: 0-450

C. Window Stools (Interior Sills):

1. Homogeneous cast polymer window stools, ½-inch or ¾-inch thick, size as shown on Drawings. Ease exposed edges. Color as shown on Interior Finish Index.

2.02 INSTALLATION MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Sink/Lavatory Mounting Hardware: Manufacturer's standard bowl clips, panel inserts and fasteners for attachment of undermount sinks/lavatories.

C. Adhesive and Sealant (Installer to verify products are approved by Cast polymer materials Manufacturer):

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. "OSI SF400"; OSI Sealants, Inc. (800-999-8920)

1) VOC Content: <50 g/L

b. "PL Premium 'Polyurethane' Adhesive"; OSI Sealants, Inc. (800-999-8920)

1) VOC Content: <50 g/L

c. "LN-902 Liquid Nails", Liquid Nails, Macco Division of ICI Paints, (800-634-0015)

1) VOC Content: <20 g/L

d. "DAP 27404", DAP, Inc. (888-327-8477)

1) VOC Content: <12.1 g/L

e. Or as recommended by cast polymer manufacturer.

2.03 FABRICATION

A. General:

1. Shop assemble cast polymer materials for delivery to site in units easily handled and to permit passage through building openings.

2. 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.

a. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.

3. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.

4. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures and fittings.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify adequacy of backing and support framing.

3.02 PREPARATION

A. Condition cast polymer materials to average prevailing humidity conditions in installation areas before installation.

3.03 INSTALLATION

A. All window stools, shall be installed as shown on Drawings and as specified by manufacturer.

B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

C. Window Stools:

1. Quality Standard: Comply with AWI Section 400 requirements for countertops.

2. Install window stools with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

3.04 ADJUSTING AND CLEANING

A. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.

B. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Owner's Representative's satisfaction.

END OF SECTION

SECTION 12 36 61

SIMULATED STONE COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Engineered Stone
    a. Vanity Tops
    b. Countertops
    c. Backsplashes
    d. Aprons
    e. Tub Seat
    f. Whirlpool Built-In Tops
    g. Casework Faces (Vertical)
    h. Credenza Tops
    i. Accent / Border Tile
    j. Wall Base
    k. Sills
    l. Thresholds

B. Engineered Glass
    a. Countertops
    b. Backsplashes

C. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry
2. Section 06 20 00 (06200) - Finish Carpentry
3. Section 07 92 00 (07920) - Joint Sealants
4. Section 09 30 00 (09310) - Tiling
5. Section 12 32 13 (06400) - Manufactured Wood-Veneer-Faced Casework
6. Section 12 32 16 (06400) - Manufactured Plastic Laminate Clad Casework
7. Section 12 36 23 (06415) – Plastic Countertops
8. Section 12 36 40 (09380) - Stone Countertops
9. Section 12 36 61.13 (09385) – Cultured Marble Countertops
10. Division 22 (15) for Plumbing Fixtures

1.02 REFERENCES

A. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. C97 - Test Method for Absorption and Bulk Specific Gravity of Dimensional Stone.
2. C99 - Test Method for Modulus of Rupture of Dimension Stone.
3. C241 - Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
4. C373 - Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fined Whiteware Products.
5. C482 - Test Method for Bond Strength of Ceramic Tile to Portland Cement.
6. C484 - Test Method for Thermal Shock Resistance of Glazed Ceramic Tile.
7. C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings.
8. C648 - Test Method for Breaking Strength of Ceramic Tile.
9. C650 - Test Method for Resistance of Ceramic Tile to Chemical Substances.
10. C672 - Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.
11. C880 - Test Method for Flexural Strength of Dimensional Stone.
12. C1026 - Test Method for Measuring Frost Resistance of Ceramic Tile to Freeze Thaw Cycling.
13. E84 - Test Method for Surface Burning Characteristics of Building Materials.

B. NSF International (NSF) Publications:

1. NSF

1. NSF/ANSI 51 "Food Equipment Materials"

C. NFS International (NFS) Publications:

1. NFS

1.03 SYSTEM DESCRIPTION

A. MARRIOTT STONE SUPPLIER PROGRAM: Marriott International has negotiated a strategic national pricing/delivery commitment agreement with the listed Program Suppliers.

1. Participating Program Suppliers require the following procedures in order to meet the core criteria of lead time, pricing and quality:
   a. General Contractor shall allow a minimum delivery lead time of [8 to 10] weeks after final approval of Shop Drawings and Samples.
   b. In order for the Project to procure strategic national pricing, the award of the contract to the Program Supplier must be completed a minimum of [12] week prior to delivery of products.
2. Participating Program Suppliers shall:

a. Supply all simulated stone items for Guestroom Sample Room. Program Suppliers shall coordinate with the General Contractor to allow for appropriate time period in Construction Schedule.

1) Refer to Section 01 11 00 “Summary of Work” for Sample Room Requirements.

b. Furnish a minimum of three percent (3%) of additional engineered stone material to account for damaged materials during shipment.

c. State the following in their bids:

1) If their bid includes field measurements, or not included.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

2. Samples for verification purposes for each color, finish, type, and variety of simulated stone required and consisting of samples not less than 4 inches square.

1.05 QUALITY ASSURANCE

A. Simulated Stone Countertops shall be supplied by one manufacturer. Color shall match for all items.

B. Installer Qualifications: Trained and approved by countertop manufacturer who has completed countertops similar in material, design, and extent to that indicated for project that has resulted in construction with a record of successful in-service performance.

C. The Contractor is responsible for verification of delivered stone materials for quantities, defects, or damage within [ten (10) days] after delivery. No compensation will be allowed to the contractor for materials and labor that may be required to replace materials after this time period.

D. Allowable Tolerances:

1. Variation in component size: +/- 1/8 inch in 8 feet.

2. Maximum height of abrupt irregularities: 1/32 inch.

3. Location of openings: +/- 1/8 inch from indicated location.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

C. General Contractor is responsible for theft or damage to stored materials. Exercise care to prevent damage during delivery, handling and storage.

1.07 PROJECT CONDITIONS

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

1. Maintain ambient temperature between 50 and 95 degrees F for 48 hours before, during and for minimum 7 days after installation.

B. Field Measurements: Where simulated stone materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support simulated stone work by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.08 SPECIAL WARRANTY

A. Quartz Engineered Stone:

1. Provide minimum One (1) year Warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 ENGINEERED STONE MATERIALS:

1. Avendra, LLC Preferred Manufacturers:
   a. None
2. Marriott Stone Supplier Program Manufacturers:
   a. Granite Tech, Inc. (610-274-1494)
      1) Contact: Bill Skalish (610-274-1494)
      2) NSF/ANSI 51 Certification: No
   b. Belstone(877-667-8663)
      1) Product: “ecoQUARTZ”
      2) Contact: Scott Smith (818-373-4900)
      3) Contact: Jacqui Ford (240-423-2296)
      4) NSF/ANSI 51 Certification: Yes
   c. J.G. Edelen Company, Inc. (410-918-1200)
      1) Contact: Dino Arcuri (570-650-0196)
      2) Contact: Kelly Smith (410-918-1200)
      3) NSF/ANSI 51 Certification: No
   d. Mgroup (Mstone) (866-342-0001)
      1) Contact: Drew Murray (706-837-0008)
      2) NSF/ANSI 51 Certification: No
3. Approved Manufacturers:

a. None

2.02 ENGINEERED GLASS MATERIALS:

1. Avendra, LLC Preferred Manufacturers:
   a. None
2. Marriott Stone Supplier Program Manufacturers:
   a. Granite Tech, Inc. (610-274-1494)
      1) Product: "Milk Glass"
      2) Contact: Bill Skalish (610-274-1494)
      3) NSF/ANSI 51 Certification: No
   b. Belstone(877-667-8663)
      1) Product: "Milk Glass Stone"
      2) Contact: Scott Smith (818-373-4900)
      3) Contact: Jacqui Ford (240-423-2296)
      4) NSF/ANSI 51 Certification: Yes

2.03 COUNTERTOP MATERIALS

A. Engineered Stone Countertops
   1. Composition: Quartz aggregate, resin, and color pigments formed into flat slabs. Slabs shall contain a minimum of 93% quartz.
   2. Physical characteristics:
      a. Water absorption: Maximum 0.04 percent, tested per ASTM C97.
      b. Bond strength: Average of 211 PSI (1.4 MPa), tested per ASTM C482.
      c. Modulus of rupture: Average of 6200 PSI (51.1 MPa), tested per ASTM C99.
      d. Flexural strength: 5620 PSI (50.3 MPa), tested per ASTM C880.
      e. Abrasion index: Minimum 62, tested per ASTM C241.
      f. Thermal shock: Pass 5 cycles, tested per ASTM C484.
      g. Flame spread: Class 1 (FS-25 or less), tested per ASTM E84.
      h. Mohs hardness: 6 to 6.5.
      i. Stain resistance: Stains completely removed, tested per ASTM C650, excluding hydroxide.

2.04 INSTALLATION MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Adhesive and Sealant as recommended by engineered stone manufacturer.

C. Sink/bowl mounting hardware:

1. Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of undermount sinks/bowls.

2.05 FABRICATION

A. General:

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions.

2. Clean surfaces to remove loose and foreign matter that could impair adhesion.

3. Remove ridges and projections. Fill voids and depressions with patching compound compatible with setting materials.

4. 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.

   a. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.

5. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trip for scribing and site cutting.

B. Thickness: Provide thickness indicated, but not less than the following:

1. Countertop: [3/4] inch[es]

2. Back and End Splashes: 3/4 inch, unless shown otherwise.

3. Thresholds: Fabricate to size and profile as indicated or required to provide transition between adjacent floor finishes.

4. Refer to Drawings and Interior Finish Index for additional requirements.

C. Edge Detail:

1. Countertops:

   a. As Shown on Interior Finish Index

2. Thresholds:

   a. Bevel edges of thresholds at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

D. Seams: Fabricate countertops without seams, if seams are required, fabricate sections indicated for joining in field.

E. Cutouts and Holes for Lavatories, Sinks, and Fittings:

1. Undercounter Lavatories: Make cutouts for undercounter lavatories in shop using template or pattern furnished by lavatory manufacturer. Form cutouts to smooth, even curves with edges at right angles to top. Ease juncture of cutout edges with tops, and finish edges to match tops.

2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

F. Labeling:

1. Label of the manufacturers name shall be permanently stamped on the underside of all countertops (engineered quartz, granite, milk glass, etc.) at least approximately every foot or so in run (or one direction) an at least every 2'-0" apart in the opposite direction. The intent is to guarantee that the label will appear on every top no matter how large or small in an accessible/readable location. As long as that is accomplished the guideline for measurements above is flexible.

2. Label to include percentage of quartz on engineered quartz tops.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive simulated stone materials, and conditions under which work will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify adequacy of backing and support framing.

3.02 PREPARATION

A. Condition engineered stone to average prevailing humidity conditions in installation areas before installation.

3.03 INSTALLATION - COUNTERTOPS

A. All countertops and other locations, shall be installed as shown on Drawings and as specified by manufacturer.

B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

1. Tops:

a. Flat and true to within 1/8" of a flat surface over a 10' length.

b. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.

C. Fit countertops around projections and to adjacent construction. Smooth and clean field cut edges. Ensure that trim will completely cover cut edges.

D. Secure joints between adjacent pieces with manufacturer's recommended adhesive with joint widths no greater than 1/8" in finished work.

E. Fill joints between countertops and adjacent construction with joint sealant. Finish smooth and flush. Comply with Section 07 92 00 (07920) "Joint Sealants."

F. Adhere sinks and lavatory bowls to tops using manufacturer's recommended sealant, adhesive and mounting hardware.

G. Provide backsplashes, sidesplashes, and aprons as indicated on the Drawings. Adhere to tops using manufacturer's recommended adhesive.

3.04 INSTALLATION – ENGINEERED STONE THRESHOLDS

A. Install engineered stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated. Refer to Section 07 92 00 "Tiling" for setting materials.

3.05 ADJUSTING, CLEANING & PROTECTION

A. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.

B. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Marriott Representative's satisfaction.

END OF SECTION

SECTION 12 36 63

ULTRACOMPACT SURFACING COUNTERTOPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ultracompact Surfacing:

a. Front Desk

B. Related Sections:

1. Section 06 10 00 (06100) - Rough Carpentry
2. Section 06 20 00 (06200) - Finish Carpentry
3. Section 07 92 00 (07920) - Joint Sealants
4. Section 11 31 00 - Residential Appliances

1.02 REFERENCES

A. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. C97 - Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
2. C99 - Test Method for Modulus of Rupture of Dimension Stone.
3. C170 - Standard Test Method for Compressive Strength of Dimension Stone.
4. C370 - Standard Test Method for Moisture Expansion of Fired Whiteware Products.
5. C373 - Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fined Whiteware Products.
6. C482 - Test Method for Bond Strength of Ceramic Tile to Portland Cement.
7. C484 - Test Method for Thermal Shock Resistance of Glazed Ceramic Tile.
8. C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
9. C648 - Standard Test Method for Breaking Strength of Ceramic Tile.
10. C650 - Standard Test Method for Resistance of Ceramic Tile to Chemical Substances.
11. C674 - Standard Test Method for Flexural Properties of Ceramic Whiteware Materials.
12. C880 - Standard Test Method for Flexural Strength of Dimension Stone.
13. C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
14. C135 - Standard Test Method for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser. C. C97 - Test Method for Absorption and Bulk Specific Gravity of Dimensional Stone
15. E84 - Test Method for Surface Burning Characteristics of Building Materials.

B. American National Standards Institute (ANSI) Publications:

1. A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.

2. A118.4 - Latex-Portland Cement Mortar.

C. NFS International (NFS) Publications:

1. NFS

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Submit Shop Drawings and product data. Include materials, component profiles, fastening methods, assembly methods, joint details, accessory listings, and schedule of finishes.

2. Samples for verification purposes for each color, finish, type, and variety of Ultracompact Surfacing required and consisting of samples not less than 4 inches square.

1.04 QUALITY ASSURANCE

A. Countertops and side panels shall be supplied by one manufacturer. Colors shall match for all items.

B. Installer Qualifications: Trained and approved by countertop manufacturer who has completed countertops similar in material, design, and extent to that indicated for project that has resulted in construction with a record of successful in-service performance.

C. The Contractor is responsible for verification of delivered Ultracompact Surfacing materials for quantities, defects, or damage within [ten (10) days] after delivery. No compensation will be allowed to the contractor for materials and labor that may be required to replace materials after this time period.

D. Allowable Tolerances:

1. Variation in component size: +/- 1/8 inch in 8 feet.

2. Maximum height of abrupt irregularities: 1/32 inch.

3. Location of openings: +/- 1/8 inch from indicated location.

1.05 DELIVERY, STORAGE, AND HANDLING

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

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

C. General Contractor is responsible for theft or damage to stored materials. Exercise care to prevent damage during delivery, handling and storage.

1.06 PROJECT CONDITIONS

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

1. Maintain ambient temperature between 50 and 95 degrees F for 48 hours before, during and for minimum 7 days after installation.

B. Field Measurements: Where Ultracompact Surfacing materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support Ultracompact Surfacing work by field measurements before being enclosed and indicate measurements on Shop Drawings.

1.07 SPECIAL WARRANTY

A. Ultracompact Surfacing:

1. Provide minimum Ten (10) year manufactures Warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 ULTRACOMPACT SURFACING MATERIALS:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. “Dekton”; Cosentino USA, Inc.. (610-274-1494)

1) Contact: Jeffrey Cannata (630-774-1432)

2) NSF/ANSI 51 Certification: No

2.02 COUNTERTOP MATERIALS

A. A. Ultracompact Surfacing Sheet:

1. Composition: Selected raw materials formed into flat slabs utilizing sinterized particle technology.

2. Collection: As shown on Interior Finish Index

3. Color: As shown on Interior Finish Index

4. Surface finish: As shown on Interior Finish Index

5. Physical characteristics:

a. Moisture expansion: 0.02 percent average, tested to ASTM C370. b. Breaking strength: 3963 lbf average, tested to ASTM C648.

b. Flexural strength: 10,828 psi average, tested to ASTM C674.

c. Water absorption: 0.03 percent average, tested to ASTM C373C373M.

d. Static coefficient of friction (slip resistance): 0.80 dry and 0.66 wet, tested to ASTM C1028. f. Wet dynamic coefficient of friction (DCOF): 0.57 average, tested to ANSI A137.1.

e. Resistance to wear: 182.2 average wear index, tested to ASTM C501. h. Thermal shock resistance: No defects, tested to ASTM C484.

f. Bond strength: 423 psi average, tested to ASTM C482.

g. Specific absorption and gravity, tested to ASTM C97/C97M:

1) Average percent of absorption per weight: 0.02 percent.

2) Average density: 156 pounds per cubic foot. k. Breaking module, tested to ASTM C99/C99M:

3) Average dry breaking strength: 8128 PSI.

4) Average wet breaking strength: 7490 PSI. l. Flexural strength, tested to ASTM C880:

5) Average dry flexural strength: 6840 PSI.

6) Average wet flexural strength: 6205 PSI.

h. Resistance to compression, tested to ASTM C170/C170M:

1) Average dry compression: 34,409 PSI.

2) Average wet compression: 17,823 PSI.

i. Resistance to abrasion, tested to ASTM C1353/C1353M: 349 average abrasion index.

j. Resistance to chemical substances; tested to ASTM C650:

1) Acetic acid, 3 percent: No affect.

2) Acetic acid, 10 percent: No affect.

3) Ammonium chloride, 100 g/L: No affect.

4) Citric acid solution, 30 g/L n: No affect.

5) Citric acid solution 100 g/L: No affect.

6) Lactic acid, 5 percent: No affect.

7) Phosphoric acid, 3 percent: No affect.

8) Phosphoric acid, 10 percent: No affect.

9) Sulphuric acid, 30 g/L: No affect.

10) Sulphuric acid, 100 G/L: No affect.

11) Chemical pool products: No affect.

12) Sodium hydroclorite solution, 20 mg/L: No affect.

13) Hydrochloric acid solution, 3 percent: No affect.

14) Hydrochloric acid solution, 18 percent: No affect.

15) Potassium hydroxide, 30 g/L: No affect.

16) Potassium hydroxide, 100 g/L: No affect.

2.03 INSTALLATION MATERIALS

A. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

B. Adhesive:

1. Latex-Portland Cement Mortar: (As approved by Manufacturer)

a. Mapei.

1) Horizontal surfaces:

(a). Ultraflex LFT

(b) Ultraflex LFT Rapid

(c) Ultraflex 3,

(d) Keraset mixed with undiluted Keraply

2) Vertical surfaces:

(a) Granirapid System,

(b) Kerabond Keralastic

(c) T/Keralastic

(d) Kerabond Keralastic System

2.04 FABRICATION

A. General:

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions.

2. Clean surfaces to remove loose and foreign matter that could impair adhesion.

3. Remove ridges and projections.

4. 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.

a. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.

B. Seams: Fabricate countertops without seams, if seams are required, fabricate sections indicated for joining in field.

C. Cutouts and Holes:

1. Make cutouts in shop using template or pattern furnished by device/accessory manufacturer. Form cutouts to smooth, even curves with edges at right angles to top. Ease juncture of cutout edges with tops, and finish edges to match tops.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive sheet materials, and conditions under which work will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify adequacy of backing and support framing.

3.02 PREPARATION

A. Condition materials within project spaces to average prevailing humidity conditions in installation areas before installation.

3.03 INSTALLATION - COUNTERTOPS

A. All countertops and other locations, shall be installed as shown on Drawings and as specified by manufacturer.

B. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

1. Tops:

a. Flat and true to within 1/8" of a flat surface over a 10' length.

b. Allow a minimum of 1/16" to a maximum of 1/8" clearance between surface and each wall.

C. Fit countertops around projections and to adjacent construction. Smooth and clean field cut edges. Ensure that trim will completely cover cut edges.

D. Fill joints between countertops and adjacent construction with joint sealant. Finish smooth and flush. Comply with Section 07 92 00 (07920) "Joint Sealants."

3.04 ADJUSTING, CLEANING & PROTECTION

A. Keep components clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion. Replace stained and damaged components.

B. Protect surfaces from damage until Date of Substantial Completion. Repair work or replace damaged work which cannot be repaired to Marriott Representative's satisfaction.

END OF SECTION

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Frames to be set in concrete floors to receive recessed floor mats
2. Recessed floor mats of the following type:
   a. Carpet-type mats

B. Related Sections:

1. Division 03 Sections for concrete work, including forming, placing, and finishing concrete floor slabs and grouting frames into recess.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product data for each type of floor mat and frame specified, including manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.
2. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual sections of floor mat and frame materials, showing full range of colors, textures, finishes, and patterns available, for each type of floor mat and frame indicated.
3. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor mats.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain floor mats and frames from one source of a single manufacturer.

B. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45watts/m^2.

C. Slip resistance in accordance with ASTM D2047, Coefficient of Friction, minimum 0.60 for accessible routes.

1.04 PROJECT CONDITIONS

A. Field measurements: Check actual blocked-out openings in floors by accurate field measurements before fabricating frames and mats show recorded measurements of final shop drawings. Coordinate fabrication schedule with construction progress to avoid a delay of the Work.

1.05 SEQUENCING AND SCHEDULING

A. Install mat frames integrally with principal pour of concrete floor system. Locate, align, and level frame members accurately, but recess in-fill by at least 1" for placement of concrete topping promptly after principal pour has hardened.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Recessed Floor Mats:

1. Avendra, LLC Preferred Manufacturers:

a. None

2. Approved Manufacturers:

a. "Pedimat - Model M1" with recessed frame, Grand Entrance, A Division of Construction Specialties, Inc. (888-424-6287)

B. Materials:

1. Carpet Tread Inserts: Unitary fusion bonded nylon with a pile height of 1/4" and a minimum yarn weight of 30 ounces per square yard.

a. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths.

b. Color: Refer to Interior Finish Index

2. Tread Rails:

a. Materials:

1) Vinyl/Acrylic: High-impact PVC alloy.

2) 6063-T5 aluminum alloy per ASTM B221.

b. Finish: M-M12C22A42, Class 1 anodized, color as shown on Interior Finish Index.

c. Spacing: 2" on center, connected by vinyl hinge

3. Recess-Mounted Aluminum Tapered Angle Frame:

a. Material: 6063-T5 aluminum alloy

b. Finish: M-M12C22A42, Class 1 anodized, frame color as shown on Interior Finish Index.

1) Mill finish frames in contact with concrete shall be primer coated.

c. 1/2-inch deep recess.

2.02 FABRICATION

A. Shop-fabricate units of floor mat work to greatest extent possible in sizes as indicated. Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints. Where possible, verify sizes by field measurement before shop fabrication.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install recessed frames and mats complying with manufacturer's instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

3.02 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses, and cover frames with plywood flooring. Maintain protection until construction traffic has ended and Project is near time of Substantial Completion.

B. Defer installation of floor mats until time of Substantial Completion for Project.

END OF SECTION

SECTION 13 11 10

POOL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 Specifications, apply to this section.

1. Related Sections:

Section 13 11 40	POOL PIPE, FITTINGS & VALVES
Section 13 11 41	POOL STRUCTURE
Section 13 11 44	POOL CHEMICAL EQUIPMENT
Section 13 11 46	POOL FEATURES AND EQUIPMENT
Section 13 11 47	POOL SIGNAGE

B. Published specifications, standards, tests, or recommended methods of trade, industry, environmental organizations and applicable code apply to work of this section.

1.02 GENERAL

A. The Contractor shall furnish all materials, equipment and labor required to construct all mechanical elements of the swimming pool part of the project, including all yard and Mechanical Room pool piping, chemical feeders, etc.

B. Contractor doing work in this Sections 13 11 10 to 13 11 47 must have at least 5 years of experience in similar construction and must submit a list of five (5) operating pools similar to this project completed by the contractor in the last 5 years.

C. Contractor doing work in Sections 13 11 10 to 13 11 47 must be pre-approval with local authority requirements and be prepared to submit the engineered drawings and required cut sheets if awarded the project.

1.03 SUMMARY

A. This division of the specifications is intended to describe the construction of the pool and all related appurtenances. Only contractors capable of meeting the qualifications and furnishing all the work called for shall be considered. All work called for in this division shall be, and remain through the warranty periods, the responsibility of this contractor. This includes complete pool construction and in exact accordance with plans and specifications, including (but not limited to):pool structures, pool finish, accents, filtration system, pool heater, chemical feed system, recirculation system, deck equipment and miscellaneous pool equipment as specified.

1.04 SUMMARY OF WORK

A. Work by Owner/Other Sub-Contractor

1. Per plans

B. Work by Pool Contractor

1. All work within the boundaries of the pool area, with the exception of mechanical (not relating to pool) and electrical work. As contained in this specification, SP Drawings.
2. Layout pool with bench marks and exact location supplied by the plans and specifications.
3. Dewatering of pool excavation for ground water.
4. Provide and install all required forms for pool construction and remove after use.
5. Furnish and install hydrostatic relief system at deep end of the swimming pool structure.

6. Provide and install required reinforcing steel for pool structure.
7. Construct shotcrete pool structures in accordance with the plans.
8. Provide and install complete pool filtration and circulation system.
9. Provide and install entire recirculation systems for pool and Schedule 40 PVC piping between pool and equipment room.
10. Furnish and install ceramic tile accent striping and waterline tile.
11. Furnish and install Diamond Brite pool finish with required ceramic tile border.
12. Provide and install the integrated disinfection/control system including disinfectant, pH adjustment, and ORP/pH control as specified.
13. Furnish and install depth markings and "NO DIVING" tile in deck.
14. Furnish and install all deck equipment and accessory equipment anchors shown and/or specified in this proposal. Coordinate all deck equipment and anchor installation with the Concrete Deck Contractor. Installation in or on the pool deck or elsewhere shall also be a part of the pool Contractor's work.
15. Provide all testing, cleaning and safety equipment.
16. Provide instruction manuals and/or operation charts for equipment replaced.
17. Provide startup supervision upon project's completion and two follow up visits within the first month of operation.
18. Maintain a superintendent or foreman on the job when pool construction work is performed and when required for coordination with other contractors. Superintendent and foreman shall be familiar with the contract's documents and shall employ qualified and experienced mechanics of proper trades.
19. Provide complete shop drawings for pool's mechanical construction and related equipment to Engineer for approval.
20. Take all measurements for pool and pool's mechanical construction and be responsible for same. Coordinate the pool work shop drawings with all other contractors affected.
21. Perform training sessions for the owner in all aspects of the pools operation, including, but not limited to, recirculation, disinfection, filtration, heating and winterization or draining. The owner must have had a complete introduction to their aquatic operations. Documentation of training is required.
22. Protect all work materials, fixtures and equipment from damage. Deliver all work to the owner clean and in perfect working condition. Keep work areas clean of debris and promptly remove waste materials from the premises.
23. The Pool Contractor is responsible for all pool work until accepted by the Owner. Acceptance of pool must correspond with agreed completion date stated.
24. Upon completion of the project and acceptance by Owner, the Pool Contractor to provide the Owner with a one (1) year full warranty on the pool shell and cover all pool equipment manufacturer's warranties based on the date of acceptance.

C. Work by Others

1. Grounding of pool structure and related appurtenances.
2. Concrete deck, trench drains & piping, area drains & piping, fencing.
3. Site access for heavy equipment.
4. All general, mechanical, electrical construction work not included in pool work.
5. Construction and backfill of all equipment room construction, including foundations, floor and walls, footings, and sumps, as required for pool mechanical room work.
6. All electrical for pool mechanical equipment. Electrical as shown on the drawings, including low voltage connections required for complete installation of chemical feed equipment (controller, chemical feeders, booster pump relays)
7. Soil tests or soil engineering for pool placement and construction.
8. Furnish any water, power, or other utility necessary to complete the said Swimming Pool available to the said location for the use of the Pool Contractor.
9. Furnish the electrical line from the available electrical service to the equipment room.

10. Furnish the potable water line from the available water service to the equipment room.
11. Furnish the gas line from the available gas service to equipment room.
12. Furnish and install waste receptacle for filter backwash with waste line to proper discharge.
13. Furnish and install heater venting.
14. Sodding and/or seeding of landscape areas.

1.05 CODES AND STANDARDS

A. All work shall conform to the latest editions of the following codes:

1. State Building Code
2. City/County/State Swimming Pool Code
3. Underwriters Laboratories (UL)
4. National Fire Protection Association (NFPA)
5. Plumbing code
6. SMACNA
7. ASHRAE

1.06 PERMITS AND FEES

A. The Contractor shall acquire all permits and approvals required for installation of the pool and pool equipment. The contractor must also arrange for inspections as required by governing agencies and obtain required certificates of inspection. Contractor shall pay all sales taxes, fees, permits and other costs pertaining to the installation of swimming pool equipment.

1.07 DISCREPANCIES; AMBIGUITIES; OMISSIONS

A. No oral interpretation will be made of the specifications or the drawings. Notify the Design Professional immediately if discrepancies or ambiguities in or omissions from the drawings and specifications are found. In the case of a discrepancy, the option which is more beneficial to the owner shall be used.

B. Interpretations of the documents will be made only in form of an addendum. Addenda shall become a part of the contract documents.

1.08 SHOP DRAWINGS

A. Submit shop drawings for all equipment in accord with General Requirements.

B. All tank, vessel and structural shops to be signed by a structural engineer registered in the project location.

1.09 DRAWINGS

A. Field measurements of existing objects shall take precedence over the information on the drawings. Any alteration of the plan described on the drawings due to a different field location shall be done in consultation with the Design Professional or his representative.

1.10 CUTTING AND PATCHING

A. Saw cut and or core drill all floor, wall openings not provided.

B. All penetrations must be properly sealed in accordance with specifications.

1.11 EQUIPMENT ERECTION

A. The Contractor shall install all equipment with best construction practices and in accordance with the manufacturer’s instructions and recommendations.

1.12 TESTS

A. The Contractor shall pay for all tests required and will provide all materials necessary to perform tests.

B. All piping shall prove absolutely tight under required tests. Make tests before pipe is covered or connected to equipment.

C. Remedy all defects found as result of testing. Repair, then repeat test as necessarily until results are acceptable.

1.13 RECORD DRAWINGS

A. Prepare clear and accurate drawings or sketches showing as-built installation of piping, fixtures and equipment. Show any differences from original plans. Submit as-built drawing to the Design Professional and Owner at completion of work.

1.14 ACCEPTANCE OF WORK

A. Acceptance shall follow the requirements of the General Conditions. When specified work is completed, the Design Professional, Owner and Contractor will conduct a detailed tour of work area prior to submitting formal acceptance of work completed. Complete conformance with the specifications in every detail is a condition precedent to the acceptance of the work by the Owner. The pool shall be a complete operating pool system with all mechanical equipment as specified in the project documents in place and operating before the Owner and the Design Professional will accept the work as complete.

1.15 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Submit two bound copies of maintenance and operating instructions for all equipment and instruct the Owner's representative on the proper use and maintenance of the new system and equipment. Manuals must include:

1. Valve legend and valve settings for pool operation procedures.
2. Pool draining and filling instructions.
3. Pool equipment shop drawing/submittal information with operating and maintenance procedures and product representatives contact name and numbers.
4. Equipment warrantee information.
5. Information on cleaning requirements of stainless steel components.
6. As-built drawings.

1.16 WARRANTIES

A. The Contractor shall guarantee all workmanship and material against defects for at least one year from the date of acceptance.

1.17 START-UP

A. The Contractor is responsible for start-up of system and balancing of flow rates.

B. Water chemistry to be balanced by Contractor.

C. All chemicals to be supplied by Owner from recommendation by Design Professional and Contractor.

D. Water balance must include consideration of saturation index, disinfectant level, pH, calcium hardness, alkalinity and all required levels as dictated by State Pool Code.

E. The contractor or their designees, as agreed upon by the Owner, must be on site for up to 4 hours per day, the day preceding grand opening, the day of grand opening, and the day following grand opening. The purpose of the on-site person is to assist the owner in maintaining the pools and related systems under full load and to ensure that staff is managing all equipment per the operations guidelines.

F. The contractor or their designees, as agreed upon by the Owner, must be on site for up to 4 hours per day, the day preceding second season opening, the day of second season opening, and the day following second season opening. The purpose of the on-site person is to assist the owner in

maintaining the pools and related systems under full load and to ensure that staff is managing all equipment per the operations guidelines.

1.18 POOL DRAINAGE / WINTERIZING

A. All drainage lines for winterizing or maintenance of the pool (s) must terminate with a 2-inch PVC ball valve with defined path to waste.

B. Contractor must be present at first draining / winterizing of the pools to supply required information.

C. Instruction Manual must include drainage instructions.

PART 2 - PRODUCTS

2.01 GENERAL

A. See plans for individual pool data and equipment listing.

B. Product manufacturers and model numbers are listed to set a level of quality for each item specified. If using alternate manufacturers, it is the responsibility of bidding contractor to meet or exceed specified equipment. The Design Professional shall be sole judge of whether equipment submitted meets or exceeds specified equipment.

C. All products are to be suitable for high corrosive environments, constructed of nonferrous materials or otherwise protected from rust/corrosion and approved for use in a pool mechanical room by the manufacturer or the Design Professional.

PART 3 - EXECUTION

3.01 GENERAL

A. The contractor shall install all equipment and structures with best construction practices and in accordance with the manufacturer's instructions and recommendations and in accordance with all local and state codes.

B. All flanges, bolts, nuts, gaskets or any part in contact with water must be stainless steel or non-metallic unless otherwise specified.

1. All other mounting hardware, flanges, bolts, nuts, materials, etc. are to be stainless steel. Where stainless steel products are not reasonably available, products must be galvanized or otherwise protected from rust/corrosion.

END OF SECTION

SECTION 13 11 40

POOL PIPE, FITTINGS & VALVES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions, Division 1 and Section 13 11 10, apply to this section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, environmental organizations and applicable code apply to work of this section.

1.02 GENERAL

A. Furnish all labor and material necessary to complete all excavation of pool, pipe trenches and related appurtenances.

B. Furnish all labor and material necessary to complete all backfill of pool walls, pipe trenches and related appurtenances.

C. The Contractor shall furnish materials, equipment and labor to furnish, install and test the piping as described on the drawings and as herein specified.

D. The Contractor shall furnish materials, equipment and labor to furnish, install and test the valves as part of the piping system as described on the drawings and as herein specified.

1.03 SUMMARY

A. This section of the specifications is intended to describe pool excavation, piping, valves and all related appurtenances.

PART 2 - PRODUCTS

2.01 GENERAL

A. Valves 3" and larger shall be wafer style for ANSI flanges with lever operators to 6". 8" and larger to be gear operated. Bodies and discs to be P.V.C. Seats and seals to be EPDM. Contractor is cautioned to verify proper sizing to avoid restriction of flow through valves.

B. All fittings to be molded; fabricated fittings are not permitted.

2.02 GRANULAR BEDDING MATERIAL

A. The aggregate bedding material placed under pool floor and around piping shall meet the following gradation requirements:

Sieve Size	Percent Passing
25.0 mm (1 inch)	100
19.0 mm (3/4 inch)	90-100
9.5 mm (3/8 inch)	50-95
4.75 mm (#4)	35-85
2.00 mm (#10)	20-65
425 um (#40)	10-35
75 um (#200)	3-10

2.03 INTERCONNECTING PIPE FROM FILTER SYSTEMS TO POOL

A. All piping connecting the filter system to the pool recirculation system shall be schedule 40 rigid P.V.C. pipe solvent weld bell with schedule 40 P.V.C. solvent weld fitting which conform to the requirements of ASTM D1785, Type 1 - Schedule 40. All connections to filter or recirculation system 2-1/2" and under in size shall be threaded connections. All connections to filter or recirculation system 3" and over in size shall be flanged connections. Any and all piping carrying water in excess of 110 degrees Fahrenheit shall be C.P.V.C., in excess of 140 degrees Fahrenheit shall be hard copper. The same shall be true for fittings. Piping shall be installed in accordance with the latest ASTM Publication for Specified Pipe. (PVC: requirements of ASTM D1784 and ASTM D1785- Schedule 40; CPVC: requirements of ASTM D-1784 and F-441)

2.04 SUPPORTS AND HANGERS

A. Supports and hangers can be clamp, saddle angle, spring or other standard type. Broad, smooth bearing surfaces are better than narrow or sharp contact, since they minimize danger of stress concentration and physical damage. All mountings and anchors shall be non-corrosive material.

B. Pipe runs in the equipment room shall be supported on Unistrut installed from wall to wall across width of equipment room. Bottom of Unistrut to be minimum 7'-6" feet above finished floor. Unistrut to be sized and installed per manufacturer requirements for span and load. Unistrut spacing per spacing requirements for PVC pipe as given in table in this section. Coordinate with general contractor. Coordinate with electrical contractor for lighting installation

C. Supports generally should not clamp pipe and prevent end wise movement needed to allow for thermal expansion. Rigid clamping is advisable at values and fittings located near sharp changes in direction when line is subjected to wide temperature changes. With exception of coupling, all plastic fittings shall be supported individually and valves shall be braced against operating torque. Generally, vertical runs are supported by spring hangers and guided with ring or U-bolts, which restrict movement of rise to one plane. See support spacing chart that follows:

SUPPORT SPACING FOR PVC PIPE (IN FEET)

Nominal pipe size (inches)	Schedule 40			Schedule 80		
	60° F	100° F	140° F	60° F	100° F	140° F
½	4 ½	4	2 ½	5	4 ½	2 ½
¾	5	4	2 ½	5 ½	4 ½	2 ½
1	5 ½	4 ½	2 ½	6	5	3
1 ½	6	5	3	6 ½	5 ½	3 ½
2	6	5	3	7	6	3 ½
3	7	6	3 ½	8	7	4
4	7 ½	6 ½	4	9	7 ½	4 ½
6	8 ½	7 ½	4 ½	10	9	5
8	9	8	4 ½	11	9 ½	5 ½
10	10	8 ½	5	12	10	6

2.05 BUTTERFLY VALVES

A. All Butterfly Valves shall be wafer style. All solid thermoplastic butterfly valves shall be of the lined body design and seal bubble tight with only the liner and disc as wetted parts. The disc shall have double"O" ring seals on top and bottom trunnions of the same material as the valve liner. Liner shall be molded and formed around the body, functioning as a gasket on each side of valve. Stem shall be of stainless steel and have engagement over the full length of the disc.

B. Valve operators shall be either of the hand wheel of hand lever type as indicated on the drawings. These manual operators shall be designed to hold the valve in any intermediate position between fully open and fully closed without creeping or fluttering. Operators shall be equipped with mechanical stop-limiting devices to prevent over travel of the disc in the open and closed positions. Valves shall close with a clockwise rotation. Operators shall be fully enclosed and designed to produce the specified torque with a maximum pull of 80 lb. on the hand wheel. Operator components shall withstand an input of 300 ft. Lbs. at extreme operator position without damage. Valves less than 8" diameter shall be lever operated. Valves greater than or equal to 8" diameter shall be gear operated.

C. Valve position indicators shall be provided on all butterfly valves.

2.06 CHECK VALVES

A. Check Valve shall be swing style, flangeless and with spring assisted closure. Valve shall be designed to be installed between ANSI 123#/1150# flanges with a P.V.C. body, one piece disc and disc arm; 316SS shaft, shaft bushings and spring; a Buna-N seat mounted in the body. The valve shall comply with performance standards of AWWA C-508.

B. Check valves three (3) inch and larger shall be wafer style. Bodies and discs to be P.V.C. Seats and seals to be EPDM.

C. Check valves two and one-half (2 ½) inches and smaller shall be socket true union. Socket and threaded bodies to be P.V.C. or C.P.V.C. Seats and seals to be EPDM.

2.07 BALL VALVES

A. Ball valves two and one-half (2 ½) inches and smaller shall be socket true union. Socket and threaded bodies to be P.V.C. or C.P.V.C. Seats and seals to be EPDM.

2.08 GATE VALVES

A. Gate valves two and one-half (2 ½) inches and smaller - brass body with rising stem and suitable for 125# S.W.P. threaded ends. Valves must be true union.

2.09 VALVES FOR HEATERS

A. Valves for heater bypass, connected to copper piping, must be brass valves.

2.10 WATER LEVEL CONTROL VALVE

A. The water level control valve shall be as specified in the equipment list and installed per manufacturers requirements.

PART 3 - EXECUTION

3.01 GENERAL

A. The contractor shall install all piping, fittings, valves and related appurtenances with best construction practices and in accordance with the manufacturer’s instructions and recommendations and in accordance with all local and state codes.

3.02 PIPING TRENCH

A. Trench Excavation

1. The Contractor shall dig the trench to the alignment and depth shown on the plans. The trench shall be sufficiently straight to permit the pipe to be laid true to line in the approximate location of the trench as indicated on the drawings.
2. The Contractor shall excavate, brace, sheet and drain the trench so that workmen may work safely and efficiently therein as required by OSHA Regulations.
3. The Contractor shall discharge dewatering pumps to the natural drainage channels.

4. The trench width may vary and will depend upon the depth the trench, the diameter and number of pipes to be laid and the nature of the material to be excavated. Trench widths, side slopes and trench bracing and sheeting shall conform to the regulations of OSHA and the appropriate state agency.
5. The sides of the trench shall be as nearly vertical as practical below a point one foot above the top of the pipe.

B. Preparation of trench bottom

1. The trench shall not have standing water when trench bottom is prepared or when pipe is laid.
2. Excavate bell or flange holes if so required, so that after placement only the barrel of the pipe receives bearing pressure from the trench bottom, and the pipe is true to line and grade.

C. Pipe laying

1. Pipe shall be carefully lowered into trench piece by piece in such a manner as to prevent damage to materials and protective coatings. Under no circumstances shall pipe materials be dumped into the trench.
2. Before lowering and while suspended, inspect the pipe for defects and coating damage. Any defective, damaged, or unsound pipe shall be rejected and removed from the site.
3. Remove all foreign matter or dirt from the inside of the pipe before it is lowered into its position in the trench, and keep the pipe clean by approved means during and after laying.
4. Bed every pipe uniformly throughout its entire length.

D. Backfill at pipe zone

1. Place Granular Bedding Material in the trench simultaneously on both sides of the pipe for the full width of the trench in six (6) inch lifts to a point one half the pipe diameter above the invert.
2. Place Granular Backfill Material in the trench from the mid height of the pipe to a point 12" above the pipe.
3. Compact bedding and backfill materials using vibrating or other mechanical equipment suitable for the soils encountered, to a density equal or greater than 100%, or as stated below, of the maximum density as measured by the Standard Proctor Test ASTM Designation D-698.
4. The pipe zone extends from the bottom of the trench to a point 12 inches above the top of the pipe.
5. The Design Professional may require backfill in the pipe zone to be placed by hand if the pipe is disturbed by backfill operations or if the backfill material is not properly compacted.

E. Trench backfill

1. Backfill the trench above the pipe zone with trench excavated material. The backfill shall be placed in lifts, not to exceed one foot in compaction thickness. Compact each lift using vibrating or other mechanical equipment suitable for the soils encountered, to a density equal or greater than 100% of the maximum density as measured by the Standard Proctor Test ASTM Designation D-698.
2. Tests to determine the compacted density of the backfill shall be ordered by the Design Professional if in the Design Professionals' opinion the compaction is not adequate.
3. All excess material shall be hauled by the Contractor to a disposal area as directed by Construction Manager.

3.03 PIPING

A. Testing of pipe connecting the filter systems to the pool circulating system shall be as follows:

1. All testing shall be done with water under pressure.
2. All piping under pressure shall be tested at 35 PSI for one full hour without any significant drop in pressure.

3. All piping under vacuum or gravity flow shall be tested at 35 PSI for one full hour without any significant drop in pressure.
4. If piping fails test, the Contractor will repair or replace pipe at his own expense.
5. If piping passes test, this does not release the Contractor of his responsibility to guarantee piping against materials and/or workmanship during warranty period.

B. Piping must be properly labeled and marked in accordance with these specifications and all local and state codes. Piping must be marked by label, color code, tag, or other distinguishing marking (permanent marker is not acceptable):

a. for direction of flow; and
b. for identifying pool, feature, or amenity served.

3.04 GLUE

A. The glue used for connecting PVC and CPVC pipe shall be clear in color at all locations where the pipe is visible. Pipe installed in non-visible locations may be connected with colored glue.

B. Glue as manufactured by IPS, cement No. 717 (clear) or equal. (Up to 12" Schedule 80)

C. Primer as manufactured by IPS, primer No. P70C (clear) or equal.

3.05 VALVES

A. The contractor shall install all valves with best construction practices and in accordance with the manufacturer's instructions and recommendations. All flanges, bolts, nuts, riser handles and gaskets must be non-corrosive, stainless steel or non-metallic unless otherwise specified.

B. Valves must be number tagged and identified in operation manual and wall chart.

END OF SECTION

SECTION 13 11 41

POOL STRUCTURE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions, Division 1 and Section 13 11 10, apply to this section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, environmental organizations and applicable code apply to work of this section.

1.02 GENERAL

A. Furnish and apply all forms required for the placement of cast-in-place concrete and grout.

B. Furnish and install concrete reinforcement as shown on the plans and specified herein.

C. The work in this section includes providing all supervision, materials, labor equipment and related services necessary to furnish and install all shotcrete material indicated on the drawings.

D. The required applications of sealants include all sealants shown and required for weather tight construction.

1.03 STANDARDS

A. FORMWORK: Conform to the following standards:

1. ACI-347-68. “Recommended Practice for Concrete Formwork”
2. ACI-301-89, “Specifications for Structural Concrete for Buildings”

B. REINFORCING: Conform to the latest editions of the following standards as set forth by the following publications of the American Concrete Institute and Concrete Reinforcing Institute:

1. ACI-318 “Building Code Requirements for Reinforced Concrete.”
2. ACI-315 “Manual of Standard Practice for Detailing Reinforced Concrete Structures.”
3. CRSI Design Handbook.

C. SHOTCRETE: The work shall conform to the latest editions of the following standards /specifications unless otherwise noted:

1. ACI 117, “Standard Tolerances for Concrete Construction and Materials”
2. ACI 301, “Specifications for Structural Concrete for Buildings”
3. ACI 305R, “Hot Weather Concreting”
4. ACI 306R, “Cold Weather Concreting”
5. ACI 318, “Building Code Requirements for Reinforced Concrete”
6. ACI 347, “Recommended Practice for Concrete Formwork”
7. ACI 506R, “Guide to Shotcrete”
8. ACI 506.2, “Specification for Materials, Proportioning and Application of Shotcrete” (Revised 1983)
9. ACI 506.3, “Guide to Certification of Shotcrete Nozzleman”

1.04 SUMMARY

A. This section of the specifications is intended to describe the pool structure, excavation, formwork, reinforcement, shotcrete, subgrade fill, sealants and all other related appurtenances.

PART 2 - PRODUCTS

2.01 GENERAL

A. Submit 5 copies of shop drawings/submittals for checking and approval:

1. Reinforcing
2. Shotcrete mix design including:
    a. The proportions and types of all materials.
    b. Fine and coarse aggregate gradations per ASTM C33.
    c. Method of determining the mix design proportions.
    d. Water/cement ratio and slump.
    e. Air content of both plastic and hardened concrete.
    f. Compressive strength at 7 and 28 days per ASTM C39.
    g. Nozzleman's ACI certification or resume of past project history demonstrating successful experience on projects of comparable size and scope as to that of the proposed work.
3. Sealants including:
    a. Manufacturer's specifications.
    b. Manufacturer's recommendations.
    c. Installation instructions.

2.02 GRANULAR BACKFILL MATERIAL

A. All subgrade stabilizing aggregate under the pool structure shall meet the following gradation requirements:

Sieve Size	Percent Passing
25.0 mm (1 inch)	100
19.0 mm (3/4 inch)	90-100
9.5 mm (3/8 inch)	50-95
4.75 mm (#4)	35-85
2.00 mm (#10)	20-70
425 um (#40)	10-45
75 um (#200)	7-15

B. This load bearing fill shall consist of any pit-run or crusher run material that is so graded from coarse to fine that, of the portion passing a one inch sieve, not more than 15 per cent by weight, will pass a No. 200 sieve.

2.03 CONCRETE CONSTRUCTION JOINT SEALANTS

A. Surface Preparation: Surfaces must be clean and dry. Remove all dirt, rocks, rust or other debris. Do not install WATERSTOP-RX in standing water.

B. Must have a three inch (3") concrete cover to exterior concrete surface.

C. Use flat serrated type when little or no joint movement is expected. Approved products:

1. Polyvinylchloride (PVC) Type, Serrated (ribbed), flat or
2. Centerbulb by Greenstreak Plastic Products Co. or
3. Volclay WATERSTOP-RX, Bentonite Strip Waterstop System as produced by Colloid Environmental Technologies Company, Arlington Heights, IL. (with Design Professional's specific application approval) or
4. Approved equal.

2.04 CONCRETE WALL PENETRATION SEALANT

A. Link Seals must be used to seal wall penetrations for piping when core drilling is used.

1. Bentonite strip waterstop (WATERSTOP-RX) at concrete joints or wall penetrations only if approved by the Design Professional for a specific application.

2.05 JOINT CAULK

A. Caulking as shown on the plans at the joint between the stainless steel perimeter and pool wall and/or at construction joints, shall be performed by a contractor experienced in such installations. Material to be:

1. two-part epoxy joint sealant, 940 FCS Dual Tube System by Cobitco/Pressure Patch; or
2. Tremco Vulkem 116 (cure time or painting required);
3. PCI 270 with accelerant; or
4. Ruscoe Permanent Sealer; or
5. Approved equal.

2.06 FORMWORK

A. Board Forms: "Standard" Grade Douglas Fir.

B. Plywood Forms: Exterior fir plywood, EXT-DFPA-AC. Use for all walls which are exposed to view.

C. Form Ties: For exposed work, obtain Design Professional's approval of type used.

D. Premade contraction joint strips if used for deck construction must not affect the surface slope. Finished slope is expected to be smooth over joint strip insert after removal.

2.07 REINFORCING BARS

A. Reinforcing Bars: ASTM A615 Grade 40

B. Fabricate to dimensions shown on the plans in accordance with requirements of the Concrete Reinforcing Steel Institute. All bars shall be bent cold, unless otherwise permitted by the Design Professional. No bars partially embedded in concrete shall be field bent except as shown on the plans or as specifically permitted by the Design Professional.

2.08 SHOTCRETE

A. Materials:

1. Portland Cement: Type I, ASTM C150 (non air-entrained).
2. Aggregate: Fine aggregate shall conform to ASTM C33 (natural sand) Coarse Aggregate shall conform to ASTM C33, #4 maximum size, class 4S. A combined grading of fine and coarse aggregate should conform to one of the gradings of Table 202b of ACI 506.
3. Water: Mixing water shall conform to ASTM C94.
4. If an admixture is included as part of the mix design submittal, a written explanation of the reason for the admixture must be included with the submittal.
5. Fly Ash is permitted in the shotcrete mix as approved by the Design Professional. Flyash is a recycled product. It's content by weight shall be submitted for LEED.
6. No chloride, chloride compounds, or materials containing a chloride will be permitted in the mix.

B. Requirements:

1. Shotcrete shall have a minimum compressive strength of 5000 psi at 28 days as measured by ASTM C39 procedures.
2. The maximum water/cement ratio shall be 0.31 for walls and 0.39 for floors.
3. Wet or dry mix process may be used for pool construction.
4. The air content of the hardened shotcrete shall be 6.5+1% when measured in accordance with ASTM C231.

5. Shotcrete shall have a slump no greater than three inches (3") for the walls and four inches (4") for the floors.

C. The mix proportions shall be controlled volumetric or weight batching in accordance with ASTM C685. Batching and mixing equipment shall be capable of proportioning and uniformly dispersing all materials at a rate that will provide adequate production.

2.09 MORTAR BED GUNITE OPTION

A. All cement for gunite shall conform to the requirements of the "Standard Specifications for Portland Cement", serial designation C-150 of the A.S.T.M. and shall be Type I or II (except where transit mixed cement is to be employed) and shall be delivered to the job site in original packages or bulk tanker and adequately protected from the weather during storage.

B. Gunite sand shall consist of clean, hard, sharp particles, and moisture content shall not exceed 5% and the sand shall be well graded in size within the following limits:

Passing Through	Percent Passing
3/8" screen	100
No. 4 mesh sieve	98-100
No. 8 mesh sieve	70-95
No. 16 mesh sieve	60-85
No. 30 mesh sieve	45-65
No. 50 mesh sieve	15-35
No. 100 mesh sieve	0-5

C. Proportions shall be one part cement to four parts gunite sand by volume mixed dry for a period of not less than one minute after materials have been added.

D. Hydration shall occur at the nozzle or the cement gun, using just enough water so that no slump shall occur in the gunite.

E. The cement gun shall be equipped with an air pressure gauge and the air pressure at the end of the gun shall not be less than 45 lbs. nor more than 70 lbs. when hose is 200 feet in length or less. Air pressure shall increase 5 lbs. for each additional 50 feet of material hose used, but not more than 300 feet of material hose shall be used unless approved by the Owner and Architect.

F. Water pressure at the nozzle shall be maintained at not less than 15 lbs. greater than the air pressure at the gun.

G. The structural gunite shall be applied against original undisturbed soil thoroughly compacted earth, or suitable forms that will not yield during application of the gunite.

H. Surfaces upon which the gunite is to be applied shall be shot at a right angle to the surface, starting at the bottom and continuing upward. It will be built up in layers of thickness that will not slump, allowing sufficient time between the placing of layers for initial set to take place.

I. All loose fine aggregate or rebound shall be removed from the surface being gunited before placing succeeding layers, and whenever possible, the first layer shall entirely cover the reinforcing steel in order to secure it in its proper position.

J. One gunite test cylinder shall be taken for each 50 yards of gunite placed.

K. Welded wire mesh shall be used for reinforcement when applying thin layers of gunite on a pool shell to reach final finish dimensions. The mesh shall be galvanized hot dipped, welded trimmed construction, 0.08 inch wire, 0.92 inch opening by McNichols Company or equivalent.

2.10 DIAMOND BRITE POOL FINISH

A. Diamond Brite “Exposed Aggregate Finish” as manufactured by Southern Grouts & Mortars, Pompano Beach, FL. Additional work with this product includes lane markers and accent striping; all, as shown on the drawings.

B. The final surface must be of a white color. Any other color must be approved by the Design Professional and all local authorities prior to the purchase of the product.

2.11 TILE

A. Tile: Products manufactured by American Olean Tile Company and Dal Tile are acceptable.

B. Portland Cement, ASTM C-150, Type 1

1. Sand, ASTM C-144
2. Lime, ASTM C-206, Type S or ASTM C-207, Type S
3. Water, Potable

C. Furnish standard grade unglazed ceramic floor tile meeting ANSI 137.1 in 2" x 2" x 1/4" tiles at locations shown on drawing.

D. Furnish custom letters and numbers and standard designations in 6" x 6" tiles at locations shown on the drawings. All tile on the deck must be non-slip. Depth markers must properly represent the water depths where they are located.

E. Custom letters, numbers, and standard designations must be in a dark contrasting color to the pool floor and pool deck. If a color other than black is proposed it must be approved by the Design Professional.

F. Bond coat shall be latex Portland cement mortar in compliance with ANSI A108.5. Color to be consistent with grout.

G. Grouting material shall be premixed, sanded, colored tiles grout in accordance with ANSI A108.10. Color to be selected by Architect.

H. Caulking sealant to be 100% silicone material appropriate for use in the designated building area conforming with Federal Specifications TT-S-0015443.

I. Lane Marker Tile Color: Ceramic tile lane markers are to be black. Submit colors to be approved by Architect/Owner.

PART 3 - EXECUTION

3.01 GENERAL

A. Handle and store all products in accordance with manufacturer’s instructions.

3.02 SEALANTS

A. Installer: A firm with a minimum of 5 years successful experience in the application of the types of materials required, and who agrees to employ only skilled tradesmen for the Work.

B. Deliver materials in manufacturer’s original, dated, unopened containers, plainly marked with the manufacturer’s name, type, and color.

C. Clearly indicate the components of multiple-part materials.

D. Comply with sealant manufacturer’s printed instructions, except where more stringent requirements are shown or specified and except where manufacturer’s technical representative directs otherwise.

1. Clean joint surfaces immediately before installation of sealant. Remove dirt, coating, moisture and other substances which would interfere with bond sealant.

3.03 FORMWORK

A. Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage.

B. Brace, shore, and tie to prevent displacement due to weight of liquid concrete together with movement s of workers, material. Use two (2) inch dimensional lumber edge forms for slabs where necessary to obtain straight edges, joints.

C. Form slots, chases, recesses, openings indicated and/or required by other trades. Cooperate in locating sleeves, anchors, nailing blocks, etc.

D. Deflection in form work shall not exceed 1/360 of each component span.

E. Horizontal form joints will not be permitted in beams.

F. Provide 3/4" chamfer on all exposed corners.

G. Set embedded items as required.

H. Keep all board and plywood forms wet previous to placing concrete; wet thoroughly just before placing.

I. Remove forms in manner to insure safety of structure.

1. Thrust block, curb and base forms may be removed in 24 hours. Wall forms may be removed in 48 hours.

3.04 REINFORCING

A. Steel bars for concrete reinforcement shall be of specified size, shape and locations called for in the drawings. Place reinforcement accurately according to the plans and approved shop drawings and secure in position by approved accessories. Minimum clear distance between parallel bars shall be not less than 1-1/2 times the bar diameter or less than 1-1/3 times the normal size of the coarse aggregate, or less than 1".

1. Spacers, chairs, ties, and other devices shall be as necessary for properly placing, spacing, supporting and fastening reinforcement in place.
2. Metal reinforcement shall be accurately positioned and secured against displacement by using annealed iron wire ties or suitable clips at intersections.
3. Vertical reinforcement in all concrete walls shall be spaced its proper distance from the face of forms by means of approved pre-cast mortar or concrete blocks.
    a. The size of the surface of the blocks to be placed adjacent to the forms shall not exceed 2 ½" square and the blocks shall be accurately cast to the thickness required.
    b. A suitable iron tie shall be provided in each block; such wire to be used to anchor the block to the steel in order to avoid displacement.

B. No splices of reinforcement shall be made except as shown on the plans, or as specified, or as authorized by the Design Professional.

C. Welded wire fabric shall have a length of lap of not less than the length of one mesh; Reinforcing bars, lap 36 bar diameters.

D. Reinforcing bars must be tied on at least 50% of all joints.

E. Before placing, thoroughly clean reinforcement of any coating, which would reduce bonding.

F. Do not heat, cut or bend bars without Architect's approval.

G. Do not splice reinforcement at points of maximum stress.

1. Stagger splices in adjacent bars and provide a minimum class "B" fusion splice, unless specifically noted otherwise on drawings.

H. The reinforcing shall be protected by the thickness of concrete indicated on the plans. Where not otherwise shown, concrete coverage over the reinforcement shall 3".

1. All reinforcement installations shall be inspected prior to the placement of shotcrete.

3.05 SHOTCRETE

A. The hardened shotcrete shall conform to the original element boundaries or as otherwise indicated on the drawings. Build in any required anchors or other embedments, and box out for any required openings.

B. Adequate ground wires shall be installed to establish the thickness and surface planes of the shotcrete build-up.

1. Both horizontal and vertical ground wires must be installed to establish the thickness and surface planes of the shotcrete build-up.
2. Both horizontal and vertical ground wires must be installed at corners and offsets not clearly established by form work (at exterior corners of walls, column or beam corners, and other locations). They may also be used as screed guides.
3. Eighteen (18) or twenty (20) gauge hard steel piano wire shall be used.
4. Ground wires should be tight and true to line, and placed in such a manner that they may be further tightened.

C. Where shotcrete is to be placed against earth surfaces, such surfaces shall first be thoroughly compacted and trimmed to line and grade. Shotcrete shall not be placed on any surface which is frozen, spongy, or wherever there is free water. The surface shall be kept damp for several hours before applying shotcrete.

D. Where a layer of shotcrete is to be covered by a succeeding layer, it shall first be allowed to take its initial set.

1. All laitance, loose material and rebound shall be removed by brooming.
2. Any laitance which has been allowed to take final set shall be removed by sand blasting and the surface cleaned with an air-water jet.
3. The surface shall be thoroughly sounded with a hammer for drummy areas resulting from rebound pockets or lack of bond. Drummy area, sags or other defects shall be carefully cut out and replaced with the succeeding layer.
4. Surfaces to be shot should be damp.

E. Surfaces which do not receive shotcrete, such as wood framing, shall be protected with waterproof or other adequate means. Adjacent structures or grounds which would be damaged by dust and rebound shall also be protected.

F. When placing shotcrete material:

1. Keep the granular base surface damp prior to shotcreting. Do not place shotcrete against surface that is frozen, spongy, or where there is free water.
2. Do not place shotcrete if the temperature of adjacent concrete is below 40 degrees F. Or above 85 degrees F., unless cold or hot weather concreting procedures are followed according to ACI 305R and 306R.
3. Control application thickness, air pressure and/or water content of the shotcrete to prevent sagging and/or debonding of successive layers.
4. The application nozzle shall be held as at such a distance and angle to facilitate placement of the shotcrete behind reinforcement prior to accumulation on the face of the reinforcement.
5. All reinforcement should be clear and free from scale, loose rust, soil, oil or other coatings that interfere with bonding.
6. Remove all overspray or rebound before final set and shotcreting adjacent surfaces. Do not use rebound or overspray material in the shotcrete mix.

7. Contractor shall provide best mix design, placement and curing techniques to minimize shrinkage cracking.

G. Notify the Design Professional 24 hours in advance of any shotcrete placements and receive permission to proceed before placing any shotcrete.

H. The wall and floor surfaces shall receive a finish as follows:

1. Wood float; steel trowel; then a light broom finish.
2. Interior concrete of the pool shall be finished per drawings.
3. The pool floor shall be wood floated after concrete is placed, shaped and smoothed up before the initial “set” has developed (true for alternate finish also).
4. After curing seven (7) days the entire concrete surface to be acid cleaned to remove any grit, laitance and other concrete components. The acid must be hosed off under pressure.
5. Examine the entire surface for abnormal roughness.

I. Curing and Cold Weather Protection: It is required that surfaces be kept continuously wet for at least seven (7) days. Spray applied membrane curing will not be permitted. The air in contact with shotcrete surfaces shall be maintained at temperatures above freezing for a minimum of seven (7) days. More detailed recommendations on winter protection may be found in ACI 306R.

J. Construction joints shall cross plane changes in the pool structure at no less than a 45 degree angle or run parallel at a minimum distance of 24” to a plane change such as the wall to floor transition, floor slope transitions and wall to wall corners. No joint shall occur within the length of a plane change.

1. Construction joints shall be built using PVC membrane waterstop unless otherwise approved by the Design Professional in advance of any shotcrete placement.
2. Construction cold joints are to be tapered to a thin edge, over a width of about one (1) foot. Square construction joints allowed only where the joint will be subjected to compressive stress. The entire joint shall be thoroughly cleaned and wetted prior to the application of additional shotcrete. No more than two (2) cold joints around perimeter of pool.
    a. A slurry of neat cement must be used on all cold joints immediately prior to installation of additional concrete. (submit mix for review - generally portland cement, bonding agent, water)
    b. The neat cement application must be preceded by air washing with an air compressor.
    c. A cold joint cannot be left longer than 48 hours. If more than 48 hours is used between pours, a construction joint must be used.

K. TESTING - FIELD QUALITY CONTROL

1. The owner will employ, at his own expense, an independent testing agency to conduct quality control testing, unless otherwise specified in Division 1. Concrete not meeting specifications shall be rejected by the Contractor without exception. Contractor will not be compensated for required correction work from concrete not meeting specifications.
2. A slump tests shall be for every 50 cubic yards of shotcrete placed or each day of shotcreting, whichever creates more tests.
3. The Contractor shall cast 1 test panel of shotcrete for each 50 cubic yards of shotcrete placed or each day of shotcreting, whichever creates more test panels. The panel shall be gunned in the same position as the work it represents. The minimum dimensions of the test panel shall be 24" by 24" by 4". The test panel shall be field cured for 48 hours in the same manner as the work it represents. A representative of the Owner or the Design Professional shall transport the test panel to the Testing Agency for required testing.
    a. On each test panel, the Testing Agency shall perform the following tests or tests as directed by the Design Professional:
4. Six, 3" diameter concrete cores shall be obtained in accordance with ASTM C42.

a. The cores shall be laboratory cured in water for a minimum of 40 hours prior to compressive strength testing (except the 3 day test will be immersed for 24 hours).
b. The compressive strength of the cores will be documented in sets of two in accordance with ASTM C42 procedures after 3,7 and 28 days of curing.

5. Test reports shall be submitted as soon as practical to the Owner, Design Professional and Contractor.
6. The test results of the compression tests of the quality control samples will be evaluated by the Design Professional based on ACI 301, Chapter 17 criteria. Any tests requested by the Design Professional to verify information as to the concrete strength shall be paid for by the Contractor for any unaccepted concrete. The Owner will pay for the test if the concrete meets specifications.
7. A static test must be performed on the pool shell prior to the application of the pool finish. The test must be completed with considerations taken for evaporation and hydration of the concrete. If the test fails, there shall be no cost to the owner and no extra days added to the contract. All costs for testing is the responsibility of the contractor.

3.06 DIAMOND BRITE POOL FINISH

A. Diamond Brite must be applied to a uniform thickness of 3/8" to ½" over entire pool surface.

B. Before start of work, verify that substrate conditions are acceptable for work to be applied under this section. Inform the Design Professional of any conditions which will preclude satisfactory installation.

C. Supply first class workmanship in all finish work. Use all products in strict accordance with recommendations and directions of manufacturer. Smooth all exposed cut edges. Be sure cut edges are clean before installing finish.

D. Maintain temperatures recommended by manufacturer during application and curing of filler, primer and epoxy.

E. Control joints and joints between each days plastering shall have a ceramic tile joint installed.

F. The installer must be recognized by the manufacturer as a certified installer of Diamond Brite. The name of the installer shall be submitted to the Design Professional prior to any work being done.

3.07 TILE

A. Scope of Work: Includes all labor, material, equipment and incidental services to furnish and install ceramic tile as shown on the drawings. Depth and no diving markers are to be supplied to the deck tiling contractor for installation. Coordinate code required placement and spacing with deck tiling contractor.

B. Submittals: Submit pattern and type of tile intended to be used. Obtain approval of job sample submittals before delivering any products to job site. Submit tile manufacturer’s maintenance guides for the Owner’s use in maintaining all ceramic tile work herein specified.

C. Product Handling: Deliver all products to job site in manufacturer’s unopened containers with grade seals unbroken and labels intact.

D. Environmental Conditions: Maintain temperature at 50 degrees Fahrenheit minimum during tile work and for seven (7) days after completion. Provide adequate lighting for good grouting and clean up.

E. Project Condition: Tile is to be installed on new concrete slabs on grade.

F. Surface acceptance: Before start of work, verify that the substrate conditions are acceptable for work to be applied under this section. Inform the Architect of any conditions which will preclude a satisfactory installation.

G. Mortar Bed at Pool: Mortar Bed acceptable only to eliminate bird baths. Mortar bed for pool bottom shall be one (1) part Portland cement, four (4) parts sand by volume. Scratch coat and mortar bed for walls shall be one (1) part Portland cement, three (3) parts dry sand or four (4) parts wet sand.

H. Installation: All swimming pool tile shall be installed in accordance with ANSI A108.1. Grout for the pool shall be in accordance with ANSI 108.10. On concrete slabs on grade, install in accordance with ANSI A108.3, TCA method F113-89.

I. Layout: Determine locations of all movement joints before starting work. Lay out all tile work so as to minimize cuts less than one-half (½) inch in size. Align all joints to give straight uniform grout lines. Make joints between tile sheets same width as joints within sheets, so extent of each sheet is not apparent at finish of work.

J. Location: Depth markers must properly represent the water level where they are located.

K. Workmanship: Supply first class workmanship in all tile work. Use all products in strict accordance with recommendations and directions of manufacturers. Proportional mixes in accordance with latest ANSI Standard Specifications. Smooth all exposed cut edges. Be sure cut edges are clean before installing tiles.

L. Cleaning: Clean tile surfaces as thoroughly as possible on completion of grouting. Remove all grout haze, observing tile manufacturer's recommendations as to use of acid and chemical cleaners. Rinse tile work thoroughly with clean water before and after using chemical cleaners.

M. Protection from Construction Dirt: Cover all tile with heavy duty, nonstaining paper taped securely in place. Prohibit all foot and wheeled traffic for a minimum period of three (3) days. Apply to all clean, completed tile floors a protective coat of neutral cleaner solution, one (1) part cleaner to one (1) part water. Just before final acceptance of tile work, rinse protective coat of neutral cleaner from all tile surfaces.

END OF SECTION

SECTION 13 11 44

POOL CHEMICAL EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions, Division 1 and Section 13 11 10, apply to this section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, environmental organizations and applicable code apply to work of this section.

1.02 REFERENCES/REGULATORY REQUIREMENTS

A. Nationally recognized standards, as applicable to all equipment and systems herein shall be adhered to, including, but not limited to NSF International.

B. Chemical Feeder pumps shall be manufactured in accordance to ISO 9001 Certification Standards and shall comply with:

1. UL Listed 7B42.
2. NSF 50 Standard.
3. ETL Equivalent to NSF 50 Standard.
4. CSA Class 9091 01.

C. Controller installed shall meet CE requirements and Data/Voice Modem shall be FCC approved.

D. pH and ORP sensors shall be manufactured in accordance to ISO 9002 Certification Standards and all wetted materials used shall be on FDA white list.

1.03 GENERAL

A. The entire disinfection system and all chemical equipment shall be designed and installed to meet all applicable State and local codes.

1.04 SUMMARY

A. This specification covers the products and installation of equipment utilized in the control of pH adjustments in swimming pool water. The entire system and all related components shall be modular design and shall be supplied as one integrated package from a single source.

B. This specification covers the product and installation of the Controller for pH, ORP & Cl2/Br2/Ozone quantity (ppm) in pool water treatment systems.

C. This specification covers the product and installation of the flowcell, flowswitch and pH & ORP sensors.

D. This specification covers the product and installation of the chlorine system. The chlorination system shall be a sodium hypochlorite system.

E. This specification covers web based software for interactive connection between Controller and PC.

F. This specification shall cover the product and installation of a supplemental ultraviolet disinfection system.

PART 2 - PRODUCTS

2.01 GENERAL

A. Submit 5 copies of shop drawings/submittals for checking and approval:

1. Chemical controller
2. Chemical feed equipment
3. Other chemical, disinfection, control related equipment

2.02 CHEMICAL CONTROLLER

A. The chemical controller shall be as listed in the equipment list and shall be a complete system including, but not limited to:

1. Controller unit
2. Keypad and digital display
3. Sensors and sensor well
4. Wiring
5. All other accessories required for a fully functioning chemical control system

2.03 PH ADJUSTMENT SYSTEM (ACID)

A. The Owner shall coordinate supply of muriatic acid to the site with storage in the Owner supplied storage tank. The solution shall be injected intermittently or continuously as required for pool and spa applications via a metering pump and chemical controller.

B. The tank shall be sealed with metering pump tubing penetrating the tank lid through holes slightly smaller than the tubing in order to maintain a seal and slightly negative pressure in the tank.

2.04 CHLORINATION SYSTEM (SODIUM HYPOCHLORITE)

A. The Owner shall coordinate supply of sodium hypochlorite to the site with storage in the pool contractor supplied storage tank. The hypochlorite solution shall be injected intermittently or continuously as required for pool and spa applications via a metering pump and chemical controller.

B. The tank shall be sealed with metering pump tubing penetrating the tank lid through holes slightly smaller than the tubing in order to maintain a seal and slightly negative pressure in the tank.

PART 3 - EXECUTION

3.01 GENERAL

A. All bypass lines shall be properly supported and run in a neat and workmanlike manner. Bypass and chemical feed lines must be installed in conduit.

B. Installation shall be performed by Owners Representative; on-site start up shall be performed by Manufacturer's Representative.

C. Controller shall be mounted on firm, smooth surface to adequately support weight of the controller and easy access to the Controller shall be allowed.

D. pH and Chlorine/Ozone/Bromine feed injector points are to be installed after heater by-pass and all sample streams.

E. All mountings and anchors shall be non-corrosive material.

END OF SECTION

SECTION 13 11 46

POOL FEATURES AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions, Division 1 and Section 13 11 10, apply to this section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, environmental organizations and applicable code apply to work of this section.

1.02 GENERAL

A. The Contractor shall furnish and install play features as specified.

B. Shall be furnished by manufacturer providing a guarantee against all failure and defects in workmanship and material for a period of one year from date of acceptance by owner.

1.03 SUMMARY

A. This section of the specifications is intended to describe pool play features and all related appurtenances.

B. This section is intended to describe the supply, handling and installation of shallow water play features.

1.04 QUALITY ASSURANCE

A. Qualifications of Suppliers and Personnel

1. Products are to be installed by the manufacturer or a manufacturer trained contractor.

B. Product quality is of utmost importance.

C. Supplier shall provide insurance certificate illustrating a minimum of $1,000,000 general and product liability per occurrence. In addition to this, the supplier shall send with this bid the proof of excess liability coverage for each occurrence in the amount of $5,000,000. Supplier shall also provide proof of worker's compensation and employer's liability coverage with policy limits of $1,000,000 per line item of coverage and proof of errors and omissions liability coverage in the amount of $1,000,000 each claim.

D. Dimensions and footing layout and design will vary between manufacturers. Those items shown within Drawings and specified are intended to establish minimum standards.

1. For bidding purposes, equipment supplier shall anticipate deviations from items shown on plans and specified herein, and submit his or her bid accordingly.
2. Necessary design deviations shall be the responsibility of the equipment supplier and shall be made to fit manufacturer's specific requirements.

1.05 CODES AND STANDARDS

A. In addition to complying with all applicable codes and regulations, comply with pertinent recommendations contained in:

1. "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.
2. "Code for Welding in Building Construction" of the American Welding Society.
3. "Specifications for Architecturally Exposed Structural Steel" of the American Institute of Steel Construction.

4. "Manual of Standard Practice for Detailing Reinforced Concrete Structures", Publication ACI 315-92 of the American Concrete Institute.
5. "Structural Concrete for Buildings", Publication ACI 301-96 of the American Concrete Institute.
6. ASTM requirements for all steel components, of the American society of Testing Materials.
7. IBC 2006.
8. ASTM F2376-08

B. Where provisions of pertinent codes and standards conflict with this specification, the more stringent shall govern.

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

PART 2 - PRODUCTS

2.01 GENERAL

A. The feature shall be manufactured from molded fiberglass and other materials inert to pool chemicals. Where metal or steel is supplied as part of the component all such parts shall be manufactured from 304 stainless steel, mild steel components (except valve body) shall not be used regardless of rust preventative coatings.

B. Piping and/or structural tubing shall be six inch rigid corrosion proof, molded reinforced fiberglass material with a smooth high gloss finish.

C. In addition to the standard colors normally offered, the owner has requested the use of custom colors. All bids must include the option for custom colors.

D. The specified in-ground pool spray features (see equipment list) shall be suitable for installation in public swimming facilities as well as splash/wet decks and zero depth entry public swimming pools.

E. All products shall be stainless steel or non-metallic, including heavy duty, high tensile strength PVC or high density molded composites.

F. Gaskets: shall be neoprene closed cell material, ½ inch thick to allow minimal field adjustments for leveling (or similar material).

G. Fasteners: shall be type 304 stainless steel for all anchoring hardware

H. Nozzles: nozzles to be a cast brass.

I. Packaging shall be in a container so as to fully protect that assembly during transport by commercial transit.

2.02 SUBMITTALS

A. Manufacturer for ease of installation shall supply drawings and instructions.

2.03 WARRANTY

A. Shall be furnished by manufacturer providing a guarantee against all failure and defects in workmanship and material for a period of one year from date of acceptance by owner.

2.04 SUBSTITUTIONS

A. Should the bidder wish to substitute products for the product specified, the bidder shall meet the intent of the design selected and associated flow rates. Any deviations from the specified products are at the discretion of the engineer and owner for denial. Pre-approval is required in accordance with specifications.

2.05 DECK EQUIPMENT

A. The rail products and anchors shall be the standard catalogued product of a company regularly engaged in the manufacture of swimming pool deck equipment. Alternate models of grab rails will not be considered unless equal to the specified product in every respect and must be submitted for approval prior to the last addendum issued. Submittal data must include complete documentation relating to all the specified features and include manufacturer's sales literature, specification sheets, installation/operation/maintenance manuals and engineering drawings.

B. The rail goods shall be fabricated of 1.90-inch O. D. x 0.120-inch wall thickness (minimum), ASTM-A-554 grade 316L stainless steel. The grab rails and their gripping surface shall comply with ADA Accessibility Guidelines for Buildings and Facilities, sections 4.26.2.

C. 6-inch deep escutcheon-less stainless steel compression anchors shall support the rails goods. One anchor spanner wrench shall be supplied.

D. All metallic components shall be passivated, in compliance with ASTM A967-99, incorporating organic acid passivation techniques for maximum corrosion resistance. The finished surface shall be a polished number 6 finish.

E. A two-year warranty shall be provided for all rail goods.

F. Advertising on deck equipment must be limited to ½" lettering in consistent colors with no sales messages or non-approved colors.

PART 3 - EXECUTION

3.01 GENERAL

A. The contractor shall install all equipment in accordance with the instructions of the manufacturer or as described on the manufacturer's drawings.

B. All products shall be shipped in a container so as to fully protect that assembly during transport by commercial transit.

C. Manufacturers bidding the project other than the manufacturer listed on the equipment list must verify the flow rates specified meet their requirements. Any required changes from the specified flow rates must be accounted for in the bid.

3.02 INSTALLATION

A. Mounting shall allow the feature to be installed in concrete with stainless steel anchor wedges. An OMNIPOD (or approved equal compatible with approved feature) shall be utilized to allow take down for winterization, swapping of play features, etc.

3.03 DECK EQUIPMENT

A. The Contractor shall install all equipment in accordance with the instructions of the manufacturer or as described on the manufacturer's drawings.

B. All work shall be done in a workmanlike manner with all equipment being installed true and plumb per drawings.

C. Pool contractor shall coordinate all deck equipment and anchor installation with the decking contractor.

END OF SECTION

SECTION 13 11 47

POOL SIGNAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary conditions, Division 1 and Section 13 11 10, apply to this section.

B. Published specifications, standards, tests, or recommended methods of trade, industry, environmental organizations and applicable code apply to work of this section.

1.02 REFERENCE STANDARDS

A. Any signage offered under these specifications shall comply with local, state and other applicable codes for pool, spa and other related signage. Verify local, state and other requirements before order.

1.03 GENERAL

A. The Contractor shall furnish and install signage as specified.

B. Shall be furnished to provide a guarantee against all failure and defects in workmanship and material for a period of one year from date of acceptance by owner.

C. Signs must be secured to vertical surfaces such that they cannot be tampered with or otherwise destroyed and/or removed by persons, weather and/or other conditions.

1.04 SUMMARY

A. This section of the specifications is intended to describe pool signage.

PART 2 - PRODUCTS

2.01 GENERAL

A. Signage lettering must be clearly legible in letters no less than ¼" in height.

B. Signage shall be printed on or adhered to 5052-H38 aluminum, .080" thick, complying with ASTM B-209. If signage is adhered to aluminum backing, it shall be constructed of non-corrosive material and adhered using an evenly coated exterior grade adhesive that is applicable for use with the two receiving materials.

2.02 GUARD/SAFETY SIGNAGE

A. Where no lifeguard is on duty; a sign must be placed in plain view within the pool enclosure and must read:

1. In clear legible letters <u>at least four inches high</u>:
    a. "WARNING – NO LIFEGUARD ON DUTY"
2. In clear legible letters <u>at least one inch high</u>:
    a. "CHILDREN MUST NOT USE THE POOL WITHOUT AN ADULT IN ATTENDANCE"

2.03 EMERGENCY TELEPHONE SIGNAGE

A. Where an emergency telephone is located within the pool enclosure; a sign must be placed in plain view within the pool enclosure and must read:

1. In clear legible letters <u>at least one inch high</u>:

a. “EMERGENCY NUMBER:_____”

2. And must include the appropriate emergency number.

B. Where an emergency telephone is not located within the pool enclosure; a sign must be placed in plain view within the pool enclosure and must read:

1. In clear legible letters at least one inch high:

a. “TELEPHONE LOCATION:_____”

2. And must include the location of the nearest telephone.

2.04 CAPACITY SIGNAGE

A. The pool capacity must be placed in plain view within the pool enclosure and must read:

1. In clear legible letters at least one inch high:

a. “POOL CAPACITY: ____ PERSONS”

2. And must include the appropriate pool capacity.

2.05 LIFESAVING EQUIPMENT SIGNAGE

A. All lifesaving equipment must be must be marked in plain view within the pool enclosure and must read:

1. In clear legible letters at least one inch high:

a. “FOR EMERGENCY USE ONLY”

2.06 POOL RULES

A. A sign must be placed in plain view within the pool enclosure and in the dressing rooms and must read:

1. In clear legible letters at least one inch high:

a. “People with communicable diseases are not permitted to use the pool”
b. “People with open sores, blisters, or cuts are not permitted to use the pool”
c. “Shower before entering pool”
d. “No spitting, spouting of water or blowing of the nose is permitted in the pool”
e. “No running or boisterous or rough play”
f. “No glassware”
g. “No diving”
h. “No pets”

PART 3 - EXECUTION

3.01 GENERAL

A. Signage must be supplied, posted and plainly visible.

B. Signage must be located at the pool and all locker rooms.

END OF SECTION

SECTION 14 21 23

ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Electric Traction Elevators.

B. Products Supplied But Not Installed Under this Section:
   1. Hoist Beam
   2. Pit Ladder

C. Work Supplied Under Other Sections:
   1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
   2. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
   3. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
   4. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
   5. Access Doors: As required for access to governor. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.

D. Related sections:
   1. Construction Facilities and Controls
   2. Earthwork
   3. Cast-in-Place Concrete:
   4. Unit Masonry
   5. Metal Fabrications
   6. Fire Alarm and Detection Systems
   7. Mechanical
   8. Electrical

E. Industry and government standards:
   1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
   2. ADAAG - Accessibility Guidelines for Buildings and Facilities
   3. ANSI/NFPA 70, National Electrical Code
   4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
   5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.

1.02 DESCRIPTION OF ELEVATORS

A. Elevator Equipment: gearless traction elevators

B. Quantity of Elevators: 2

C. Rated Capacity: one @ 3000 pounds and one @ 3500 pounds

1. Verify size of shaft and coordinate with contractor prior to any shaft construction.

D. Landings: 5

E. Openings: 10 (3500 pound elevator) or 5 (3000 pound elevator)

F. Travel: see drawings

G. Elevator Equipment shall conform to the requirements of seismic zone

H. Rated Speed: 150 fpm

I. Clear Inside Dimensions (W x D): 6'-8" x 4’-11" --- VERIFY

1. Note: cab shall accommodate gurney.

J. Cab Height: 8'

K. Clear height under suspended ceiling: 7'-7" MIN.

L. Entrance Width & Type: 3'-6" Front side Openings (3000 pound elevator); center openings (3500 pound elevator)

M. Entrance Height: 7'

N. Main Power Supply: 208 Volts + 5%, three-phase

O. Operation: Duplex

P. Machine Location: Inside the hoistway mounted on car guide rail

1.03 PERFORMANCE REQUIREMENTS

A. Car Performance

1. Car Speed ± 5% of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance

1. Vertical Vibration (maximum): 25 mg
2. Horizontal Vibration (maximum): 25 mg
3. Jerk Rate (maximum): 1.3 ft/sec3
4. Acceleration (maximum) 1.3 ft/sec2
5. In Car Noise: = 55 dB(A)

6. Leveling Accuracy: ±0.2 inches
7. Starts per hour (maximum): 120

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product literature for each proposed system.
1. Cab design, dimensions and layout.
2. Layout, finishes, and accessories and available options.
3. Controls, signals and operating system.
4. Color selection charts for cab and entrances.

B. Shop Drawings:
1. Clearances and travel of car.
2. Clear inside hoistway and pit dimensions.
3. Location and layout of equipment and signals.
4. Car, guide rails, buffers and other components in hoistway.
5. Maximum rail bracket spacing.
6. Maximum loads imposed on building structure.
7. Hoist beam requirements.
8. Location and sizes of access doors.
9. Location and details of hoistway door and frames.
10. Electrical characteristics and connection requirements.

C. Operation and maintenance data:
1. Provide manufacturer's standard maintenance and operation manual.

1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum of ten years' experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.

B. Installer: The equipment manufacturer shall install the elevator.

C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.06 DELIVERY, STORAGE AND HANDLING

A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional lablor costs for double handling will be the responsibility of the general contractor.

B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.07 WARRANTY

A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.08 MAINTENANCE SERVICE

A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 Months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.

B. Maintenance service be performed during regular working hours of regular working days and shall include regular time call back service.

C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Provide AC gearless machine room-less traction elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:

1. Acceptable manufacturers:
    a. Otis Elevator Co. - Gen2™ Product
    b. Schindler Elevator Corp. - 3300 Product

2.02 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

A. Controller: Provide microcomputer based control system to perform all of the functions.

1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.
3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.
4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.

B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.

C. Controller Location: See Drawings

2.03 EQUIPMENT: HOISTWAY COMPONENTS

A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.

B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.

C. Buffers, Car and Counterweight: Polyurethane buffer.

D. Hoistway Operating Devices:
   1. Emergency stop switch in the pit
   2. Terminal stopping switches.
   3. Emergency stop switch on the machine

E. Positioning System: System consisting of magnets and proximity switches.

F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.04 EQUIPMENT: HOISTWAY ENTRANCES

A. Hoistway Entrances
   1. Sills: extruded.
   2. Doors: Hollow metal construction with vertical internal channel reinforcements.
   3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.
   4. Entrance Finish: Brushed Stainless Steel.
   5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.05 EQUIPMENT: CAR COMPONENTS

A. Provide car frame with adequate bracing to support the platform and car enclosure.

B. Platform shall be all steel construction.

C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

D. Steel Cab
   1. Car Wall Finish: Brushed stainless steel.
   2. Car Front Finish: Brushed stainless steel.
   3. Car Door Finish: Brushed stainless steel.
   4. Ceiling:
      a. Translucent three panel suspended ceiling with L.E.D. lighting and Brushed Aluminum frame.

5. Handrail:
    a. Round tube brushed aluminum - 1.5 in.. Rails to be located on Back Wall of car enclosure.
6. Flooring: By others.
7. Threshold: Aluminum

E. Emergency Car Signals
1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.
2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.
3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

F. Ventilation: fan.

2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.
1. Full height car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be amber 7 Segment. All texts, when illuminated, shall be amber. The full height car operating panel shall have a polycarbonate face plate that is shatterproof and impact resistant in a color and pattern per manufacturers standard selection.
2. Additional features of car operating panel shall include:
    a. Car Position Indicator within operating panel (amber).
    b. Elevator Data Plate marked with elevator capacity and car number on car top.
    c. Help buttons with raised markings.
    d. In car stop switch per local code.
    e. Firefighter's hat.
    f. Firefighter's Phase II Key-switch.
    g. Call Cancel Button.
    h. Pre-programmed integrated ADA phone (complete description of krms features included as standard)
    i. Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where

personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.

j. Firefighter's Phase II emergency in-car operating instructions.

B. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a polycarbonate face plate that is shatterproof and impact resistant in a color per manufacturers standard selection.

1. Hall fixtures shall feature round, mechanical, illuminated buttons in raised fixture housings. Hall fixtures shall correspond to options available from that landing. Buttons shall be flat flush in vertically mounted fixture. Hall fixtures should not be jamb-mounted. Hall lanterns shall feature amber illumination.

C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

2.07 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

1. Duplex Collective Operation (two cars): Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. In the absence of system activity, one car can be made to park at the pre-selected main landing. The other car shall remain at the last landing served. Only one car shall respond to a hall call. If either car is removed from service, the other car shall immediately answer all hall calls, as well as its own car calls.
2. Zoned Car Parking.
3. Relative System Response Dispatching.

B. Standard Operating Features to include:

1. Full Collective Operation
2. Fan and Light Control.
3. Load Weighing Bypass.
4. Ascending Car Uncontrolled Movement Protection
5. Top of Car Inspection Station.
6. Zoned Car Parking.
7. Relative System Response Dispatching

C. Elevator Control System for Inspections and Emergency

1. Provide devices within controller to run the elevator in inspection operation.
2. Provide devices on car top to run the elevator in inspection operation.
3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.
4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.

5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.
7. Provide the means for the control to reset elevator earthquake operation.

2.08 EQUIPMENT: DOOR OPERATOR AND CONTROL

A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

F. In elevator with rear exits at each landing, the rear exits (laundry room and maid’s rooms) shall only open upon activation by a card reader (integrated with building/guestroom card access system). Elevator contractor shall be responsible for acquiring and installing the card reader and interface with elevator controls.

PART 3 EXECUTION

3.01 EXAMINATION

A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

B. Do not proceed with work until unsatisfactory conditions are corrected.

C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

D. Prior to start of Work, verify projections greater then 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less then 75 degrees from horizontal.

E. Prior to start of Work, verify landings have been prepared for entrance sill installation.

F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.

G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.

H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.02 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.03 INSTALLATION

A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.

B. Properly locate guide rails and related supports at locations in accordance with manufacturer’s recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.

C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.

D. Lubricate operating system components in accordance with manufacturer recommendations.

E. Perform final adjustments, and necessary service prior to substantial completion.

3.04 CONSTRUCTION

A. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.

1. Ensure adequate support for entrance attachment points at all landings.
2. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.

3. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
4. Coordinate interface of elevators and fire alarm system.
5. Coordinate interface of dedicated telephone line.

3.05 TESTING AND INSPECTIONS

A. Perform recommended and required testing in accordance with authority having jurisdiction.

B. Obtain required permits and provide originals to Owner's Representative.

3.06 DEMONSTRATION

A. Prior to substantial completion, instruct Owner's Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

END OF SECTION

SECTION 14 91 33

LINEN CHUTES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Linen (laundry) Chutes

B. Related Sections:

1. Section (07 62 00) - Flashing and Sheet Metal
2. Section (21 10 00) - Fire Suppression
3. Div. (22) and (26): Hook-ups for water and electrical services are included in Divisions (22) and (26) respectively.

1.02 REFERENCE STANDARDS

A. NFPA Code: Comply with applicable portions of National Fire Protection Association (NFPA) No. 82.

1.03 SUBMITTALS

A. Submit "Letter of Conformance" in accordance with Section (01 33 00) with the following supporting data:

1. Mark each copy to identify applicable products, characteristics, models, options and other supplemental data to clearly communicate information specific to this project.
2. Product Data: Submit manufacturer's product specifications, standard details, installation instructions and general recommendations for total pre-engineered chute system. Mark-up data sheets to indicate actual selections for sizes and other details of installation.
3. Shop Drawings: Submit 1/4" scale section/elevation drawing, 1/2" scale typical landing plans, and 1-1/2" scale details of chute fabrication. Distinguish between factory fabrication and field assembly work. Show required piping, wiring connections and conduit runs for wiring.
4. Quality Control Submittals:
   a. Test Reports: Fire rating, in duplicate.

1.04 QUALITY ASSURANCE

A. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the Work of this Section.

B. Chute and Accessories: Conform to NEPA, UL and Local Code requirements.

C. Sprinklers: Comply with requirements of NFPA 13, Section 4-4.9 and NFPA 82, Section 4-4.1.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to job site in unopened containers bearing manufacturer's name and content identification.

B. Store materials as recommended by the manufacturer.

1.06 PROJECT CONDITIONS

A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:
   1. Wilkinson-Hi-Rise, LLC. (800-686-6726)
   2. Midland Metalcraft Co. (847-678-4007)
   3. US Chutes Corp. (800-872-4883)
   4. Chutes International (800-882-4883)

2.02 LINEN CHUTE

A. Chute Sections: 16 gage aluminized steel per NFPA 82, 24" diameter.
   1. Factory assemble sections to greatest extent possible. Disassemble only as necessary for shipping and handling limitations. Clearly mark for reassembly and coordinated installation.
   2. Design sections to flash inside sections below, with no bolts, clips or other projections inside chute to snag flow of materials.
   3. Except for joints required for shipment and installation, provide factory welded or lock-seamed tight joints.
   4. Provide expansion joint in chute between supporting grid floor frames.

B. Vent: Extend full diameter chute section through roof; terminate top 4'-0" above roof. Equip 16 gauge aluminized steel vent cap with ventilation air space around full diameter of vent riser, insect screen, condensation gutter, roof flashing.

C. Door Units:
   1. UL Labeled Door Units: Provide UL "B" labeled door units 1.0 hour with 30-minute temperature rise of 250 deg. F., (139 deg. C.), complete with closers.
   2. Chute Intake Door/Frame Units: Provide self-closing units at each landing and at heights above floor as indicated. Use manufacturer's recommended heights if not otherwise shown. Provide 21 inch x 18 inch door size. Equip doors with positive latch, latch handle, and manufacturer's standard keyed cylinder locks. Provide manufacturer's standard stainless steel door units, AISI Type 302/304 with standard satin finish or No. 3 directional polish.
      a. Factory Bolt Doors to Intake Throat.
   3. Discharge Hopper: Horizontal rolling, UL B (1-1/2 hr.) Labeled, spring counterbalanced with fusible link. Provided with required offsets and reinforcing, structural angle door around discharged opening, 2" IPS drain at low point of hopper, pipe pedestal support, 28" wide x 36" high x 14 gage stainless steel hopper door, manufacturer's standard self-latching devices.
   4. Accessories:
      a. Flushing Spray Head: 3/4" IPS; installed above top intake door.
      b. Sprinkler Heads: 1/2 IPS; located at or above top service opening of chute, at alternate floor levels in buildings over two stories in height, and at lowest service area, unless otherwise required by local code.

1) Recess heads out of chute area through which linen travels, with recessed area designed to avoid collection of foreign matter.

5. Foot Operators: Equip each hopper-type door unit with manufacturer's standard foot operator, which unlatches and opens hopper door when foot pedal is depressed.
6. Electrical Interlocks: Equip the intake door units with electrical interlocks. All doors are normally unlocked. When system is energized by opening one door, the remaining doors shall be automatically locked until system is de-energized. Provide manual control switch stations where indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas in which Work is to be performed. Report in writing, to Owner's Representative, all prevailing conditions that will adversely affect satisfactory execution of Work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Starting Work constitutes acceptance of the existing conditions and this Contractor shall then, at their expense, be responsible for correcting all unsatisfactory and defective Work encountered.

3.02 INSTALLATION

A. General: Comply with chute manufacturer's instructions and recommendations. Assemble components with tight, non-leaking joints and anchor securely to supporting structure with sufficient anchorages to withstand impact and wind loading stresses on vent units. Provide for thermal expansion movement of chute sections. Except as otherwise indicated, install chutes plumb, without offsets of obstructions, for free fall of materials within chutes. Install chute systems complete with doors, and with safety and fire-resistive components and accessories.

B. Intake and Discharge Doors: Install doors at heights and locations indicated. Provide anchorages, wall/chute interfaces, self-closing operation, self-latching and similar features of installation to comply with labeling and fire-resistive requirements for fire-resistive door construction. Interface door units with throat sections of chutes in a manner which will ensure safe, snag-proof, sanitary depositing of materials in chutes by users.

1. Coordinate foot-pedal door operator installation with door and enclosure wall installation.

3.03 TESTING, ADJUSTING, CLEANING

A. Test operate components of chute system upon completion of installation; demonstrate use and safety features to Owner's personnel. Operate doors, locks and interlock system to demonstrate that hardware is adjusted and electrical wiring is connected correctly. Where possible, complete test operations prior to installation of shaft enclosures.

B. Cleaning: Following completion of enclosure walls and ceilings, clean exposed surfaces of finished metal components of chute system. Remove foreign substances and repair imperfections in finishes, but do not remove UL labels.

END OF SECTION

SECTION 210500 --- FIRE PROTECTION BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section specifies the basic materials, methods and workmanship for the work described in Division 21.

1.02 RELATED DOCUMENTS

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

B. Section 211000 – Water Based Fire Protection Systems

C. Section 221005 – Plumbing Piping

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Floor sleeves shall be uncoated or galvanized steel pipe not less than Schedule 40.

B. Sleeves in rated walls shall be as required for U. L. listing.

C. Temporary sleeves in poured concrete walls or floors shall be poly-sleeve with nailing flange.

2.02 IDENTIFICATION - PIPE

A. Pipes. Labels shall describe the contents and direction of flow. Labels shall be secured to pipe with full self-adhesive banding around pipe at each end of label. Labels shall be a red background with white letters and shall read: “FIRE PROTECTION WATER”.

B. Pipe label sizes shall comply with the following table:

Pipe Size	Band Width	Letter Height
1/2" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"

C. Acceptable Manufacturers:
   1. Seton
   2. Brady
   3. Marking Services

2.03 IDENTIFICATION - VALVES

A. Colored plastic with 1/2" white letters such as Bakelite attached with a brass chain.

B. Control valves shall be tagged as to service and normal position.

C. Other valves tagged as to service and function.

D. Control valve tags shall have black background, other valves tags shall have colors corresponding to service described above.

E. Valve list shall be included into operation and maintenance manuals.

PART 3 EXECUTION

3.01 PIPE SLEEVES

A. Provide sleeves for all piping as follows:
   1. Precast slabs.
   2. Exposed finished areas.
   3. Fire rated or acoustical walls.
   4. Exterior walls.
   5. CMU walls.

B. Sleeves shall be a minimum of 1” greater in inside diameter than piping passing through sleeve.

C. Fabricate all pipe sleeves of new material, cut square and reamed.

D. All sleeves through walls, extend full thickness of wall, cut flush with finished surfaces.

E. Pack space between all sleeve and pipes, comply with Division 7 - Firestopping.

F. Permanent sleeves through floor slabs for exposed piping shall extend 1/2" above finished floor. Sleeves shall extend 4” above the floor in mechanical penthouses, dishwashing areas, kitchens, server areas, and all other wet areas. Where concealed, set sleeves through floor and flush with floor. Concealed piping is piping in walls, chases and similar locations. All sleeves through existing floor slabs shall be bonded to the slab with an epoxy bonding material.

G. In locating and setting sleeves, this Contractor is to leave a minimum of 4" between sleeves in rows or clusters. Where the normal spacing of top and bottom reinforcing bars cannot be maintained or the bars are interrupted because of sleeves size or cluster location, provide extra reinforcing bar as specified elsewhere around the clusters or sleeves as approved by Architect or Engineer.

3.02 IDENTIFICATION

A. All piping in unfinished, accessible areas shall be identified every 50 feet, both sides of wall or floor penetration and at every change of direction as to type of service and direction of flow.

B. All equipment furnished shall be labeled.

3.03 ACCESS PANELS (FINISHED SURFACES)

A. Coordinate with Division 1 to locate access panels where required for access to equipment, valves, etc.

3.04 FLOOR, WALL AND CEILING ESCUTCHEON PLATES

A. Where uncovered, exposed pipes pass through walls or floors, they shall be fitted with wall or floor plates.

B. Plates shall be set tight against wall or floor. Plates on other than exposed pipes shall be prime coated.

3.05 DRAWINGS

A. In general, the drawings of the Fire Protection Systems and equipment are to scale, however, to determine exact locations of walls and partitions the Contractors shall consult the Architectural and/or Structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

B. Drawings of piping although shown on scale drawings are diagrammatic only. They are intended to indicate approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the drawings, the Architect or Engineer may require any or all contractors to change the location or arrangement of their work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect or Engineer.

C. Where discrepancies are discovered after certain portions or phases of any contract have been installed, the Architect or Engineer reserves the right to require any or all Contractors to make minor changes in pipe equipment locations or arrangements to avoid conflicts with other work at no additional cost to the Owner.

D. Because the drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. Contractors shall furnish all incidental labor, material or equipment for the systems in their control so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

3.06 FIRE SAFETY PRECAUTIONS

A. The Contractors shall exercise extreme care to maintain and exercise adequate fire safety precautions throughout the work. This shall include providing sufficient firefighting devices, watchmen, standby helpers or other precautions during construction, in use of temporary heat, welding, brazing, sweating, testing or other phase of work.

B. At all times, access shall be maintained for fire department trucks to the building.

C. All welding, brazing, cutting and sweating operations performed in the vicinity of or accessible to combustible materials, shall be adequately protected to make certain that sparks or hot slag does not reach the combustible material and start a fire.

D. All glass, glazed materials and other finish, in the vicinity of welding, brazing and cutting, shall be masked by the Contractor performing the welding work.

E. When necessary to do cutting, welding, brazing, sweating and similar work in the vicinity of wood, in shafts or in the vicinity of any combustible material (and the combustible material cannot be removed), the materials shall be adequately protected with fire retardant blankets or similar approved coverings.

END OF SECTION

SECTION 211000 --- WATER BASED FIRE PROTECTION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water based fire protection systems and equipment:
   1. Fire suppression water underground storage tank.
   2. Fire pump.
   2. Fire Department Connections.
   3. Standpipe Hose Valves.
   4. Fire Protection Piping, Fittings and Hangers.
   5. Fire Protection Valves.
   6. Detector Check Valves.
   7. Backflow Preventers.
   8. Sprinklers.
   9. Pressure Gauges.

1.02 RELATED DOCUMENTS

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

B. Section 210500 – Fire Protection Basic Materials and Methods.

C. Section 221005 – Plumbing Piping.

1.03 REFERENCES

A. ASME B1.2 – Gauges and Gauging for Unified Inch Screw Threads; American Society of Mechanical Engineers; 1983.

B. ASME B1.12 – Class 5 Interference-Fit Thread; American Society of Mechanical Engineers; 1987.

C. ASME B16.1 – Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; American Society of Mechanical Engineers; 2005.

D. ASME B16.3 - Malleable Iron Threaded Fittings; American Society of Mechanical Engineers; 1998.

E. ASME B16.4 – Gray Iron Threaded Fittings Classes 125 and 250; American Society of Mechanical Engineers; 2006.

F. ASME B16.5 – Pipe Flanges and Flanged Fittings: NPS 1/2 through 24; American Society of Mechanical Engineers; 2003.

G. ASME B16.9 – Factory-Made Wrought Buttwelding Fittings; American Society of Mechanical Engineers; 2007.

H. ASME B16.11 – Forged Steel Fittings, Socket-Welding and Threaded; American Society of Mechanical Engineers; 2001.

I. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

J. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; American Society of Mechanical Engineers; 2001 (R2005).

K. ASME B16.25 – Buttwelding Ends; American Society of Mechanical Engineers; 2007.

L. ASME B18.2.1 – Bolts: Square, Hex, Heavy Hex, and Askew Head, Screws: Hex, heavy hex, hex flange, lobed head, and lag (inch series) – 2010.

M. ASME B1.20.1 – Inside thread conical, outside thread conical – 1983.

N. ASME B31.1 – Power Piping; American Society of Mechanical Engineers; 2012.

O. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; American Society for Testing and Materials; 2010.

P. ASTM A135 – Standard Specification for Electric-Resistance-Welded Steel Pipe; American Society for Testing and Materials; 2009.

Q. ASTM A795/A795M – Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2008.

R. ASTM A234/A234M – Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; American Society for Testing and Materials; 2011a.

S. ASTM B75/B75M – Standard Specification for Seamless Copper Tube; American Society for Testing and Materials; 2011.

T. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; American Society for Testing and Materials; 2009.

U. ASTM F437 – Standard specification for Schedule 80 CPVC threaded fittings; chlorinated polyvinyl, chloride (CPVC), 2009.

V. ASTM F438 – Specification for Schedule 40 CPVC socket-type fittings, 2009.

W. ASTM F-439 – Specification for Schedule 80 CPVC socket-type fittings, 2011.

X. ASTM F-442 – Non-metallic piping specification for special listed chlorinated polyvinyl chloride (CPVC) pipe.

Y. AWWA C-509 – Resilient-Seated Gate Valves for Water Supply Service; American Water Works Association; 2009.

Z. FM Data Sheet 2-8N – Installation of Sprinkler Systems; FM Global Property Loss Prevention Data Sheets; September 2004.

AA. FM Data Sheet 3-26 – Fire Protection Water Demand for Non Storage Sprinklered Properties; FM Global Property Loss Prevention Data Sheets; January 2006.

BB. NFPA 13 – Installation of Sprinkler Systems; National Fire Protection Association; 2010.

CC. NFPA 14 – Standpipe and Hose Systems; National Fire Protection Association; 2003.

DD. NFPA 25 – Standard for Inspection, Testing, and Maintenance of Water Based Fire Protection Systems; National Fire Protection Association; 2008.

EE. NFPA 70 (NEC) – National Electric Code; National Fire Protection Association; 2008.

FF. NFPA 72 – National Fire Alarm Code; National Fire Protection Association; 2010.

GG. NFPA 291 – Flow Testing and Marking of Hydrants; National Fire Protection Association; 2010.

HH. UL Standard 262 – Gate Valves for Fire-Protection Service; Underwriters Laboratories.

II. UL Standard 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems; Underwriters Laboratories; 2006.

JJ. UL Standard 1971 – Standard for Signaling Devices for the Hearing Impaired; Underwriters Laboratories; 2002.

1.04 DESCRIPTION OF WORK

A. Provide all equipment and material necessary for a complete and operating fire suppression (sprinkler) system as shown on drawings and/or specified herein. This shall include all piping, fire pump, water storage tank, and materials obviously necessary though not specifically mentioned or shown.

B. All equipment used shall be UL listed and/or FM approved for the application for which it is installed.

C. Installation shall comply with NFPA 13, 2010. The standpipe installation shall comply with NFPA 14, 2003.

D. Provide a fire sprinkler system that shall meet or exceed City of Oneonta and insurance carrier requirements and conform to applicable State and NFPA Codes and standards and meet manufacturers' criteria and tests. This shall include all City ordinances or policies adopted or enforced by the City.

E. The sprinkler and piping layout is diagrammatic and is intended to show the general arrangement of the system and DOES NOT necessarily show all features or components of the system.

F. Division 21 Fire Protection Contractor shall make connection to water service entrance flange and provide distribution system as required. Installation of the fire service or combined service piping up to the service entrance flange is described by others.

1.05 SUBMITTALS

A. Complete sprinkler/standpipe system shop drawings shall be submitted and stamped approved by the Reviewing Government Agency and Owner’s Insurance Carrier prior to submittal to Architect/Engineer for acceptance. Neither fabrication nor installation shall proceed without notification of acceptance. Complete sprinkler shop drawing submittals shall include:

1. Manufacturer's literature and specification sheet on all equipment and trim specified herein.
2. Hydraulic calculations.
3. Installation drawings drawn to an indicated scale, on sheet of uniform size showing the following information:
    a. Name of owner and occupant.
    b. Location, including street address.
    c. Contractors name, address and telephone number.
    d. Point of compass.
    e. Ceiling construction.
    f. Full height cross section.
    g. Location of partitions.
    h. Occupancy of each area or room.
    i. Size and location of city main in street, flow test results, and location of underground sprinkler service connection.
    j. Indicate the elevation of the gauge hydrant relative to the floor slab.
    k. Make, type and nominal orifice size of sprinkler.
    l. Temperature rating, type and location of sprinklers.
    m. Pipe type.
    n. Nominal pipe size and cutting lengths of pipe (or center to center dimensions).
    o. Type and location of hangers, sleeves, braces and methods of securing sprinklers when applicable.
    p. All control valves, check valves, drain pipes and test connections.
    q. Hydraulic reference points and remote areas.

B. Upon receipt of approval from each reviewing authority, forward a copy of approval documentation to Architect/Engineer.

C. Upon receipt all required approvals, submit at least five copies of shop drawings to Architect/Engineer for final review.

D. Insurance carrier submittals shall be directed to:

1.06 CLOSEOUT AND AS-BUILT DOCUMENTATION

A. In addition to the requirements of Division 1, the Division 21 contractor shall provide three copies of as-built fire protection documents prior to final closeout of the project. As-built documentation shall include, but is not limited to, the following:

1. Manufacturer's literature on all specified equipment and trim.
2. O & M manuals for all equipment when manufacturer's instructions are applicable.
3. As-built CAD drawings indicating all fire protection work installed as part of the contract. This shall include all field changes differing from what was shown on the accepted shop drawing submittal. The CAD drawings shall be AutoCAD (dwg) format.
4. Printed drawings of the submitted as built CAD drawings.
5. A bound copy of the latest edition of NFPA 25.
6. A signed copy of the Contractor's Under Ground Material and Test Certificate as described in NFPA 13, 2010, Chapter 10.
7. A signed copy of the Contractor's Above Ground Material and Test Certificate as described in NFPA 13, 2010, Chapter 24.
8. A signed copy of the Contractor's Standpipe Above Ground Material and Test Certificate as described in NFPA 14, 2003, Chapter 11.

PART 2 PRODUCTS

2.01 WALL POST INDICATOR VALVE ASSEMBLY (if required by City)

A. Wall type, post indicator valve assembly with lockable operating wheel, visual sight glass and control valve. Valve assemblies identified as supervised shall be electronically supervised and shall be connected to building fire alarm system.

B. Manufacturer: Mueller A-20814 or approved equal.

2.02 FIRE DEPARTMENT CONNECTION (confirm requirements with City)

A. 3-way fire department fire department connection, polished brass, flush mount, 2-1/2" x 2-1/2" x 2-1/2" x 6" (or as required by the City), back outlet complete with plugs and chains. Fire department connections shall be permanently labeled "AUTO-SPKR AND STANDPIPE". Hose threads to match City requirements. Exposed exterior piping for yard type connections shall match the finish and material of the fire department connection.

B. Manufacturer: Elkhart Model 167-W, Potter Roemer 5835, Croker 6115, or approved equal.

2.03 STANDPIPE HOSE VALVE

A. 2-1/2" angle hose valve, satin brass or bronze, including cap and chain. Hose threads to match city requirements. Provide pressure reducing type where static pressures exceed 175 PSI.

B. Manufacturer: Elkhart U-25 (standard pressure), Potter Roemer 4065 (standard pressure), or approved equals.

2.04 FIRE PROTECTION PIPING

A. General

1. Provide materials specified; however, only one material selection will be allowed for each nominal pipe size in any zone of a concurrent facility.
2. Pipe shall be new and have the manufacturer's name or brand along with the applicable ASTM standard marked on each length of pipe.
3. Steel piping shall be rated for a working pressure not less than 300 PSI.

B. Wet System Piping (Non Pool Areas):
   1. Black steel pipe, ASTM A135 or A53, Schedule 40 or Schedule 10.
   2. Black lightwall sprinkler pipe, ASTM A 795
   3. Galvanized Threadable lightwall steel pipe, ASTM A135 or A53.

C. Wet System Piping (Pool Areas):
   1. Galvanized steel pipe, ASTM A135 or A53, Schedule 40 or Schedule 10.

D. Piping from Fire Department Connection to the FDC check valve:
   1. Galvanized steel pipe, Schedule 40 or Schedule 10, ASTM A135 or A53.

2.05 ABOVE GROUND PIPE FITTINGS AND JOINING METHODS

A. Screwed Fittings:
   1. Wet Systems: Cast iron or malleable iron fittings, ASME B16.3 or ASME B16.4, standard weight, class 125 (or 150) for pressures up to 175 PSI. Standard weight malleable iron fittings may be used for pressures up 300 PSI for pipe sizes 6" and less (reference NFPA 13, 2010, 6.4.4.2).
   2. Dry Systems: Screwed galvanized iron fittings, ASME B16.3, class 150 for pressures up to 175 PSI or class 300 for where system pressures range from 175 PSI up to 300 PSI.
   3. Pre Action Systems: Screwed galvanized iron fittings, ASME B16.3, class 150 for pressures up to 175 PSI or class 300 for where system pressures range from 175 PSI up to 300 PSI.

B. Flanged Fittings:
   1. Cast iron, gasketed, short body, ASME B 16.1, class 125, for pressures up to 250 PSI. Flange bolts shall be hexagon head, cadmium plated, dimensions in compliance with ASME B 18.2.

C. Welded Fittings:
   1. Wet Systems: Steel, rated for pressures of at least 300 PSI, standard weight, black, and in compliance with ASME B 16.9, ASME B 16.25, ASTM A 234, ASME B 16.5, and ASME B 16.11.

D. Grooved Fittings and Couplings:
   1. Pressure ratings shall be at least 300 PSI.
   2. Grooved fittings and couplings shall be ASTM A536 ductile iron. Gaskets shall pressure-responsive, synthetic EPDM rubber gasket, ASTM D-2000. Steel bolts and nuts shall be ASTM B-633 zinc plated.
   3. Grooved fittings and couplings used on wet pipe systems shall be enamel coated.
   4. Grooved fittings and couplings used on dry and pre-action pipe systems shall be galvanized and shall be listed for such service.
   5. Grooving tools and coupling gaskets shall be from the same manufacturer as the couplings.
   6. Provide flexible type couplings for installations in seismic areas where required by NFPA 13.
   7. Acceptable Manufacturer: Victaulic or approved equal.

E. Schedule 40 steel pipe shall be joined by:
   1. Screwed joints in compliance with specification ASME B 1.20.1
   2. Welded joints in compliance with specification ASME B31.1, Chap. 5 (black pipe only).
   3. Approved combination of couplings, gaskets and grooves.
      a. Grooves may either be rolled or cut.
      b. Grooves shall be dimensionally compatible with the couplings.

F. Schedule 10 and black lightwall steel sprinkler pipe shall be joined by:
   1. Welded joints in compliance with specification ASME B 31.1, Chap. 5
   2. Approved grooved type couplings. Grooves shall be rolled only (cut grooving is not be allowed). Grooves shall be dimensionally compatible with the couplings.

G. Threadable galvanized lightwall steel pipe shall be joined by:
   1. Screwed joints in compliance with specification ASME B 1.20.1.

2.06 PIPE HANGERS AND SUPPORTS

A. Piping hangers and supports used for fire protection systems shall comply with NFPA 13, 2010, Chapter 9.

2.07 CONTROL VALVES

A. All control valves shall have maximum working pressure of at least 175 PSI. Where pressure exceeds 175 PSI, utilize extra heavy valves with a maximum working pressure of 300 PSI.
B. Provide tamper switch for all valves indicated as "supervised" on drawings. Tamper switches shall be suitable for 120 volt A.C. operation and have two S.P.D.T. switches.
C. Provide breakaway padlock and chain for each valve identified as "locked" on drawings and/or as described in Part 3.
D. Butterfly Control Valves
   1. Indicating type control valves which do not close in less than five seconds when operated at maximum possible speed from a fully open position.
   2. Manufacturer: Victaulic Firelock, Milwaukee Butterball, Nibco, or approved equal.
E. OS&Y Valves
   1. Cast iron, outside stem and yoke, flanged end, gate valve, AWWA C-509 and UL-262.
   2. Manufacturer: Kennedy, Mueller, Wilkins, or approved equal.

2.08 FIRE WATER SERVICE

A. Fire suppression water service is provided by a system of wells, pumps, treatment & storage which is designed by others under separate contract with the Owner.
B. Underground
   1. Pipe - Ductile iron, ANSI A21.51 (AWWA C151)
   2. Fittings - Ductile iron
   3. Joints - Mechanical with threaded rod flange and rubber gasket

2.09 CHECK VALVES

A. All check valves shall have a soft seat and shall have maximum working pressure of at least 175 PSI.
B. Check valves used for fire department connections shall be equipped with 1/2” street 90° and a ball drip.

2.10 DRAIN VALVES

A. Drain valves shall be full port, lockable ball valves, bronze body, 400 psi WOG, ball valve, locking lever handle, chrome plated bronze or stainless steel ball, teflon seat, teflon stuffing box seal, screwed connection.
B. Acceptable Manufacturers: Apollo, Nibco, Milwaukee, Wilkins, AGF.MFG, Inc., or approved equal.

2.11 PRESSURE RELIEF VALVE

A. Brass body, adjustable, pressure relief valve. ¾" NPT male inlet, ¾" NPT female outlet. Adjustable pressure setting between 15 PSI and 175 PSI.

B. Acceptable Manufacturers:

Potter Roemer 4058 or approved equal

2.12 DETECTOR CHECK AND METER (if required by City)

A. Listed detector check valve with bypass meter sized as required by City.

B. Manufacturer: Ames Series 1000 DCV, Wilkins 910, Watts SS07F, or approved equal.

2.13 BACKFLOW PREVENTER (if required by City)

A. Reduced pressure zone backflow preventer.

B. Assembly shall have two independent check valves and be supplied with OS&Y gate valves and ball type test cocks.

C. Manufacturers: Watts No. 909 or 009 (1/4" – 3"), Febco 860, Wilkins (975XL) or 375 (3/4" – 2"), Conbraco Industries No. 200-T2 or approved equal.

2.15 WATER FLOW ALARM SWITCHES - WET SYSTEMS

A. Two SPDT contacts, adjustable retards, suitable for 120 volt A.C. operation. Paddle type flow switch shall have a sensitivity setting to signal any flow of water that equal or exceeds the discharge of one sprinkler.

B. Manufacturer: Potter VSR series, Viking VSR, or approved equal.

2.16 QUICK RESPONSE SPRINKLERS

A. Quick response sprinklers shall be used in light and ordinary hazard occupancies except where noted on drawings or specified herein. Substitution of extended coverage sprinklers for standard spray sprinklers, without prior approval, is not allowed. Sprinklers shall be standard spray, quick response type; 1/2" orifice and a temperature rating between 155 and 170 degrees Fahrenheit unless otherwise shown in drawings or indicated herein. UL listed and/or FM approved. Select only models with UL and/or FM approval for intended application.

1. Pendent type sprinklers with brass finish in unfinished areas and all chrome finish in finished areas. Tyco Model "TY-FRB", Reliable Model "F1FR", or approved equal.
2. Recessed pendent type sprinklers with all chrome finish. Tyco Model "TY-FRB", Reliable Model "F1FR", or approved equal.
3. Concealed pendent sprinklers with white cover plate. Tyco Model "Royal Flush II", Reliable Model "G5-56, plain cover plate, or approved equal.
4. Standard spray horizontal sidewall sprinklers. Brass finish in unfinished areas and all chrome finish in finished areas. Tyco Model "TY-FRB", Reliable Model "F1FR", or approved equal.
5. Horizontal, extended coverage type sidewall sprinklers (light hazard only). Brass finish in unfinished areas and chrome finish in finished areas. Tyco Model "TY-FRB ", Reliable Model "F1FR", or approved equal.
6. Upright type sprinklers with brass finish in unfinished areas and chrome finish in finished areas. Tyco Model "TY-FRB", Reliable Model "F1FR", or approved equal.
7. Dry recessed pendent sprinklers with all chrome finish. Tyco Model "DS-1", Reliable Model "F3QR", or approved equal.
8. Dry pendent sprinklers. Brass finish in unfinished areas and all chrome finish in finished areas. Tyco Model "DS-1", Reliable Model "F3QR", or approved equal.

9. Dry sidewall sprinklers (light hazard only). Brass finish in unfinished areas and all chrome finish in finished areas. Tyco Model "DS-1", Reliable Model "F3QR", or approved equal.

2.17 STANDARD RESPONSE SPRINKLERS

A. Standard response sprinklers may only be used in elevator equipment rooms and shafts, when such protection is required. Sprinklers shall be standard spray, standard response type; ½" orifice and an intermediate temperature rating. UL listed and/or FM approved. Select only models with UL and/or FM approval for intended application.
   1. Pendent type sprinklers with brass finish in unfinished areas and all chrome finish in finished areas. Tyco Model "TY-B", Reliable Model "F1", Viking Model "Micromatic M", or approved equal.
   2. Upright type sprinklers with brass finish in unfinished areas and chrome finish in finished areas. Tyco Model "TY-B", Reliable Model "F1", Viking Model "Micromatic M", or approved equal.

2.18 RESIDENTIAL SPRINKLERS

A. Residential sprinklers may be used in the sleeping (dwelling) units and their adjoining corridors in accordance with NFPA 13, 2010, 8.4.5.1. Sprinklers shall be standard spray, residential type; 1/2 inch orifice and a temperature rating between 155 and 170 degrees Fahrenheit unless otherwise shown in drawings or indicated herein. Use UL listed and/or FM approved sprinklers only.
   1. Pendent type sprinklers with all chrome finish. Tyco Model LFII, Reliable Model F1Res Residential, or approved equal.
   2. Standard spray horizontal sidewall sprinklers. Recessed chrome finish in all guestroom with finished areas. Tyco Model LFII, Reliable Model F1Res Residential, or approved equal.
   3 Concealed pendent sprinklers with white cover plate. Tyco Model "LF II", Reliable Model "RFC49, or approved equal.

2.19 CONCEALED COMBUSTIBLE SPACESPRINKLERS

A. Specific application, fast response, upright sprinklers designed specifically for use in light hazard, concealed combustible applications. Sprinkler K factor of 5.6, temperature rating of 175 degrees Fahrenheit.

   1. Tyco Model CC2 or approved equal.

2.20 PRESSURE GAUGES

A. Pressure gauges shall be 4" diameter, white face, stainless steel case, clear polycarbonate lens, pressure range of 0 – 300 PSI and operating temperature from -40°F to 140°F, 1/4" NPT lower mount.

B. UL Listed and FM Approved for fire sprinkler applications.

C. Manufacturer: Fire Protection Products or approved equal.

2.21 DIELECTRIC UNIONS AND FLANGES

A. All 2" and smaller copper piping connections to a dissimilar metal shall be made with insulated type dielectric unions or flanges.

B. All 2-1/2" and larger copper piping connections to a dissimilar metal shall be made with insulated dielectric flange kits. Dielectric flange kit shall consist of a 1/8" phenolic retainer with a Viton sealing ring. Provide one phenolic sleeve and two 1/8" phenolic washers and two 1/8" galvanized steel washers

for each bolt.

C. Dielectric flange kits shall be Class 150 rated at 175 psig and conform to ANSI B16.42 and B16.24.

2.22 PIPE SLEEVES

A. Floor sleeves shall be uncoated or galvanized steel pipe not less than Schedule 40.

B. Sleeves in rated walls shall be as required for U. L. listing.

C. Temporary sleeves in poured concrete walls or floors shall be poly-sleeve with nailing flange.

2.23 EXTERIOR WALL LINK SEALS

A. Modular type consisting of synthetic rubber links with threaded rods and nuts. Temperature rating -40 to 250 degrees.

B. Acceptable Manufacturer:

1. Link Seal, Thunderline Corporation

2.24 FLOOR, WALL AND CEILING ESCUTCHEON PLATES

A. Escutcheon plates shall be at least 1/32" thick and shall be equipped with set screws for locking around pipe. Plates shall be finished steel chromium plated.

PART 3 EXECUTION

3.01 PIPING

A. Coordinate installation with all other trades.

B. Run all piping in a straight line, parallel or perpendicular to walls and partitions, whenever possible.

C. Properly brace all system piping and equipment to prevent movement during operation.

D. Exposed piping passing through floor, walls and ceilings shall be provided with escutcheons.

E. Sprinkler branch piping, cross main piping, and feed main piping shown on drawings to serve recessed pendent, concealed pendent, or other similar ceiling mounted sprinklers shall be installed and concealed above the ceiling.

F. All exposed sprinkler piping and hangers, and supports are to be painted by Division 9. Sprinkler piping, hangers, and supports do not require paint in mechanical rooms and electrical rooms. Division 21 contractor shall remove all adhesive labeling on all piping to be painted.

G. For buildings or portions of buildings designed to resist earthquakes, provide earthquake protection for sprinkler piping and equipment in accordance with NFPA 13, 2010, 9.3.1.

H. Hangers and supports shall be installed in accordance with NFPA 13, 2010 Chapter 9. Support spacing shall be per NFPA 13, 2010, table 9.2.2.1.(a)

I. Sprinkler branches for elevator hoistways, when required, shall only serve sprinklers in the hoistway and shall terminate in the hoistway.

J. Sprinkler branches for elevator equipment rooms, when required, shall only serve sprinklers in the equipment room and shall terminate in the equipment room.

K. Sprinkler piping passing through walls or floors shall be sleeved in accordance with Section 210500.

L. Pipe penetrations through rated walls, rated floors, and rated ceilings shall be provided with U.L Listed fire stopping assemblies as specified in Section 210500.

M. Sprinkler piping shall not be routed over electrical panels.

3.02 DRAINAGE

A. Wet sprinkler system branchlines, crossmains and feedmains may be installed level with drains provided at low points and trapped water locations.

B. Trapped sections shall be provided with drains in accordance with NFPA 13, 2010, 8.16.2.5 for wet systems.

C. Install main drain, drain valve and pressure gauge on each system main riser. Size as per NFPA 13, 2010, 8.16.2.4.1 thru 2010, 8.16.2.4.8. Main drain shall discharge outside of building. Provide concrete splash block.

D. For buildings zoned per floor, provide drain riser and run floor control tests and drains to drain riser. Size drain and riser as per NFPA 13, 2010, 8.16.2.4.2 thru 2010, 8.16.2.4.7. Riser shall terminate outside of building. Provide concrete splash block.

E. At each vertical standpipe, provide drain valve and piping, located at the lowest point of the standpipe piping and downstream of the isolation valve in accordance with NFPA 14, 2003, 7.12.2.1.

F. All cross mains shall terminate in 1-1/4" or larger pipe with grooved cap with outlet to allow for flushing in accordance with NFPA 13, 2010, 8.16.3.3.

3.03 FIRE DEPARTMENT CONNECTION

A. Fire department connection mounting height shall be between 18" and 48" above grade.

B. Unless directed otherwise by the authority having jurisdiction, fire department connections shall be located on the address side of the building.

C. Rectangular plates for multiple outlet fire department connections shall be set level.

D. The fire department connection shall be located within 300 lineal feet of a fire hydrant unless otherwise directed by the local jurisdiction.

E. Sizing of fire department connection piping shall be in accordance with NFPA 13, 2010, 8.17.2.3, but in no case shall be less than 6" to serve the connected standpipe.

F. Fences, bushes, trees, walls or similar objects shall not obstruct the fire department connection.

G. To protect against freezing, fire department connection piping shall extend from the inside face of the exterior wall a minimum of 4'-0" prior the installation of the fire department connection check valve.

3.04 VALVES

A. All valves regulating the water supply to sprinklers shall be supervised. Supervised valve switch contact adjustment by this Contractor. Switches shall be mounted so not to interfere with normal operation of valve and shall be adjusted to operate within two revolutions of the valve control, or when the stem has moved, no more than one-fifth of the distance from its normal position. Wired by Division 28.

B. All valves controlling water supplies for automatic sprinklers shall be locked or secured in the open position. Locks are not required for valves located in a room or space with access limited to essential personnel only.

C. Provide OS&Y gate valves at the service entrance to the building on both sides of the service entrance check valve. If the building is served by a fire pump, all valves on the inlet side of the pump shall be OS&Y gate valves.

D. On combined sprinkler and standpipe systems, at each floor zone assembly, provide a check valve immediately downstream of the zone isolation valve in accordance with NFPA 14, 2003, 6.2.5.1.

E. On standpipe systems, provide a supervised valve at the base of each standpipe riser in accordance with NFPA 14, 2003, section 6.2.2.

3.05 PRESSURE GAUGES

A. Provide gauges where required by NFPA 13 and NFPA 14. Gauges shall be valved to permit testing of gauge. Gauges shall be accessible for operation, inspection, tests, and maintenance.

3.06 RELIEF VALVE

A. Provide relief valve on all wet sprinkler zones in compliance with NFPA 13, 2010, 7.1.2.

3.07 WATER FLOW ALARMS

A. Provide flow switches or pressure switches as indicated on drawings. Wired by Division 28. Flow switches shall not be mounted in or within 12” of any fitting that changes direction of waterflow. Adjust delay setting to eliminate false alarms.

3.08 SPRINKLERS

A. Locate sprinklers and other devices to be installed in suspended ceilings carefully to match the coordinated pattern of the ceiling, lighting fixtures, diffusers and other elements to be installed thereon. Refer to architectural reflected ceiling plan. Sprinklers shall be centered in ceiling tile +/-2".

B. Install escutcheon plates for pendent sprinklers mounted in finished ceilings and horizontal sidewall sprinklers mounted on walls. Maximum depth of escutcheon below ceiling or out from wall shall be 1-1/4". Two piece escutcheons exceeding a depth of 1-1/4" are not approved.

C. Provide sprinkler guards to protect sprinklers from damage where moving objects are likely to cause sprinkler damage. Also, provide sprinkler guards where noted on drawings and where sprinkler is installed less than 7’-6” A.F.F. Substitute concealed type sprinklers for sprinklers with guards in finished areas, such as corridors, where sprinkler is less than 7’-6” A.F.F.

D. Provide intermediate and high temperature sprinklers near heat-producing devices in compliance with NFPA 13, 2010, 8.3.2.5.

E. Provide intermediate temperature sprinklers in all attics and skylights.

F. For kitchen exhaust hoods and grease laden ducts not otherwise protected by a listed chemical fire suppression system, install sprinklers under hood and in duct per NFPA 13, 2010, 7.10.1 thru 7.10.2.5.

G. Provide sprinklers above and below fixed obstructions, including ductwork and open overhead garage doors over 48” in width, as per NFPA 13, 2010, 8.5.5.3.1.

H. Where required to be installed by code, sprinklers in elevator shafts and equipment rooms shall be intermediate temperature standard response with a temperature rating of 200 degrees F or greater. The temperature rating shall also be a minimum of 65 degrees F higher than that of an adjacent heat detector.

I. Within enclosed, non-combustible or limited combustible stair shafts with non-combustible or limited combustible finishes, sprinklers shall be installed at the top of the stair shaft and below the bottom landing of the stairway in compliance with NFPA 13, 2010, 8.15.3.2.1. Sprinklers may be omitted below the bottom landing if the area below the landing is enclosed and access is limited such that storage below the landing is prevented.

J. For unenclosed stairs, all stairs of combustible construction, and all stairs containing combustible finishes; sprinklers shall be installed above the top of the stair and below the stairways and landings at each stairway level in compliance with NFPA 13, 2010, 8.10.6.3.2 and 8.15.3.1.

K. Sprinklers shall be provided at each stairway landing where two or more doors exit to the landing from separate fire divisions in compliance with NFPA 13, 2010, 8.15.3.3.

L. Sprinklers shall be provided beneath landings or stairways where the areas beneath is used for storage in compliance with NFPA 13, 2010, 8.15.3.2.3.

M. Provide sprinklers to protect all concealed combustible spaces in accordance with NFPA 13, 2010, 8.15.1 thru 8.15.3.1. The Division 21 contractor shall provide all sprinklers, piping, hangers, and other system components necessary in order to comply with this requirement in order to provide a fully functional and code compliant system.

N. Where partial ceilings or cloud type ceilings are installed, sprinklers shall be provided both above and below such ceilings.

3.09 SPRINKLER CABINET

A. Provide sprinkler cabinet near sprinkler system riser assembly. Include a stock of extra sprinklers including each type and rating installed as described in NFPA 13, 2010, 6.2.9. Provide wrench(es) suitable for use with all sprinklers installed. Provide per the following schedule:
   1. Facilities having under 300 sprinklers, provide at least 6 sprinklers.
   2. Facilities having 300 to 1000 sprinklers, provide at least 12 sprinklers.
   3. Facilities having over 1000 sprinklers, provide at least 24 sprinklers.

3.10 TEST CONNECTIONS AND OUTLETS

A. Install inspector's test connections and outlets at locations indicated on drawings. In addition, provide inspectors test connections and outlets that will ensure each installed flow switch can be tested. Pipe to drain to outside or to location approved by Engineer. Inspector’s test outlets for dry systems must be installed at remote end of systems.

3.10 SIGNS

A. Provide permanent visible signs to identify all drains, test connections, control valves and fire department connections.
B. Signage shall comply with NFPA 13, 2010, 6.7.4 for valves, 8.17.2.4.7 for fire department connections, and 16.5 for riser assemblies.
C. Standpipe installations shall conform to the signage requirements of NFPA 14, 2003, 6.2.8.1 through 6.2.8.4 as well as NFPA 14, 2003, 6.5 through 6.7.3.
D. Provide a sign above the fire department connection indicating the pressure required at the inlets to deliver the system demand in compliance with NFPA 14, 2003, 6.3.5.2.2.
E. Unless otherwise provided by Division 10, the Division 21 contractor shall provide permanent, durable, and readily visible signs for rooms containing the following: controls for air conditioning systems, sprinkler risers, sprinkler valves, or other fire detection or suppression or control elements. Comply with IFC section 510.1. Coordinate required locations and wording with the Authority Having Jurisdiction and Division 23.
F. Provide hydraulic design information signs in compliance with NFPA 13, 2010, 24.5. Each sign shall be permanently marked, weatherproof metal or rigid plastic, and secured with corrosion resistant wire or chain. Such signs shall be placed at each zone control riser or sub zone. Each individual sign shall include the following information:
   1. Location of the design area or areas
   2. Discharge densities over the design area or areas
   3. Required flow and residual pressure demand at the base of the riser
   4. Occupancy classification or commodity classification and maximum permitted storage height and configuration
   5. Hose stream allowance included in addition to the sprinkler demand
   6. The name of the installing contractor
G. Provide general design information signs in compliance with NFPA 13, 2010, 24.6. Each sign shall be permanently marked, weatherproof metal or rigid plastic, and secured with corrosion resistant wire or chain. Each sign shall identify the system design basis and information relevant to the inspection, testing, and maintenance requirements for the system. Such signs shall be placed at each zone control riser or sub zone. Each individual sign shall include the following information:

1. Name and location of the facility protected
2. Presence of high-piled and/or rack storage
3. Maximum height of storage planned
4. Aisle width planned
5. Commodity classification
6. Encapsulation of pallet loads
7. Presence of solid shelving
8. Flow test data
9. Presence of flammable/combustible liquids
10. Presence of hazardous materials
11. Presence of other special storage
12. Location of auxiliary drains and low point drains
13. Original results of main drain flow test
14. Name of installing contractor or designer
15. Indication of presence and location of antifreeze or other auxiliary systems

H. The Division 21 contractor shall provide any additional signage pertaining to the fire protection system as may be required by the authority having jurisdiction.

3.11 SPRINKLER SYSTEM HAZARD CLASSIFICATIONS

A. Sprinkler hazard classifications shall comply with NFPA 13, 2010, Chapter 5 and the locally adopted Fire Code.

B. Unless noted otherwise, all general storage rooms shall be designed at a minimum to protect Class I-IV commodities to a storage height of 10'-0" in any configuration and Group A plastics to 5'-0" in any configuration (i.e., Ordinary Hazard Group 2). Reference NFPA 13, 2010, Table 13.2.1.

C. Hazard classifications shall correspond with the following unless noted otherwise:

1. Light Hazard:
    a. Occupancies where the quantity of combustibles is low and where fires with relatively low heat release rates are expected shall be considered as Light Hazard.
    b. Such locations include, but are not limited to: office areas, dining areas, church sanctuaries, classrooms, corridors, attics without storage, residential spaces, etc.
2. Ordinary Hazard – Group 1:
    a. Electrical rooms, mechanical rooms, and laundries.
    b. Miscellaneous storage areas, as defined by NFPA 13, 2010, 3.9.1.18; with the following configurations:
        1) Class I commodities stored in palletized, bin box, shelf, rack, and back to back shelf storage 12 feet or less in height.
        2) Class II commodities stored in palletized, bin box, shelf, rack, and back to back shelf storage 10 feet or less in height.
3. Ordinary Hazard – Group 2:
    a. Miscellaneous storage areas, as defined by NFPA 13, 2010, 3.9.1.18; with the following configurations:
        1) Class II commodities stored in palletized, bin box, shelf, rack, and back to back shelf storage 12 feet or less in height.
        2) Class III commodities stored in palletized, bin box, shelf, rack, and back to back shelf storage 12 feet or less in height.
        3) Class IV commodities stored in palletized, bin box, and shelf storage 12 feet or less in height with a maximum ceiling height of 32 feet.
        4) Class IV commodities stored in rack and back to back shelf storage 10 feet or less in

height.

5) Group A plastics stored 5 feet or less in height.

3.12 SPRINKLER SYSTEM HYDRAULIC CALCULATIONS – NFPA 13 DESIGN

A. Contractor shall provide a hydraulically designed sprinkler system designed in compliance with NFPA 13, 2010, Chapter 22 and all applicable State and local codes.

B. Hazard classifications shall be designed with the following base design criteria:

1. Light Hazard: 0.10 GPM per sq. ft. over the most remote 1,500 sq. ft.
2. Ordinary Hazard, Group 1: 0.15 GPM per sq. ft. over the most remote 1,500 sq. ft.
3. Ordinary Hazard, Group 2: 0.20 GPM per sq. ft. over the most remote 1,500 sq. ft.
4. See items below for additional requirements.

C. Where extended coverage sprinklers are used, the base design area shall be that noted above or the area protected by 5 sprinklers, whichever area is greater, in compliance with NFPA 13, 2010, 11.2.3.2.2.3.

D. Combined hose streams and water supply durations shall be as noted below (reference NFPA 13, 2010, Table 11.2.3.1.2) – assumes systems are electronically supervised at an approved and constantly attended location.

1. Light Hazard: 100 GPM for 30 minutes
2. Ordinary Hazard Group 1: 250 GPM for 60 minutes
3. Ordinary Hazard Group 2: 250 GPM for 60 minutes

E. Allowable decreases to base remote areas are as noted below:

1. Wet systems for light and ordinary hazard occupancies are allowed to have the design area reduced, based on ceiling heights and the installation of quick response sprinklers installed throughout, where permitted by NFPA 13, 2010, 11.2.3.2.3.1. The number of sprinklers in the design area shall never be less than 5 and unprotected ceiling pockets must not exist. If the area under consideration is below a sloped ceiling, the maximum height of the room shall determine the allowable reduction as described in NFPA 13, 2010, 11.2.3.2.3.3.
2. The room design method; in compliance with NFPA 13, 2010, 11.2.3.3; is allowed where it is applicable and all required conditions are satisfied. All rooms must be enclosed with walls having a fire resistance rating equal to the water supply duration established for the protected occupancy. Doors and other openings must be protected as described in NFPA 13, 2010, 11.2.3.3.5. Doors must be self-closing. Doors and other openings must have fire resistance ratings as described in NFPA 13, 2010, 11.2.3.3.5. The Division 21 contractor shall confirm all required conditions are satisfied and note the required conditions on their submittals when utilizing the room design method.

F. Apply increases to remote areas as noted below:

1. Where ceiling slopes exceed 2” in 12”, the design area for wet systems shall be increased by 30% without revising the density as required by NFPA 13, 2010, 11.2.3.2.4.
2. For buildings having unsprinklered concealed combustible spaces, design areas shall be 3000 square feet for spaces adjacent to the concealed combustible space unless one of the exceptions identified in NFPA 13, 11.2.3.1.4 (4) are met. This increase shall be applied after all other modifications have been made in compliance with NFPA 13, 2010, 11.2.3.2.7.2.

G. Where residential style sprinklers are used, sleeping (dwelling) units and corridors directly adjacent to sleeping (dwelling) units shall be designed in compliance with NFPA 13, 2010, 11.3.1.

H. When specific application concealed combustible space sprinklers are used, they shall be designed with a minimum density of 0.10 GPM per sq. ft. over the most remote 1,000 sq. ft. for wet pipe systems in accordance with the manufacturer installation instructions.

I. Pipe Sizing

1. The system shall be calculated to allow for a safety factor. The safety factor shall be the pressure available at the required flow that is above the required pressure at the required flow. The safety factor shall meet the requirements of the authorities having jurisdiction but in no case be less than 5 PSI.

2. Pipe serving more than two sprinklers shall be a minimum of 1-1/4" in size.

K. Additional compensation shall not be granted for fire sprinkler distribution piping up to and including 8” in diameter and sprinkler branch piping 2-1/2” in diameter if such piping sizing is necessary to satisfy hydraulic calculation requirements.

L. Unless otherwise waived by the Authority having jurisdiction, The Division 21 contractor shall incorporate the domestic water demand in the hydraulic calculations as an additional hose stream at the point of connection of the domestic water system to the combined fire/water service piping.

M. Water velocity in piping not to exceed 20 feet/second.

N. The Division 21 contractor shall perform a flow test at the site prior to final hydraulic calculations. The flow test shall be in compliance with NFPA 291, 2010 Edition. The elevation of the gauge hydrant relative to the floor slab shall be indicated on the shop drawings.

3.13 WET STANDPIPE SYSTEM INSTALLATION – NON HIGH RISE

A. Contractor shall provide a hydraulically calculated standpipe system.

B. In no case shall standpipe distribution piping, including the vertical standpipe risers, be less than 6".

C. Additional compensation shall not be granted for standpipe distribution piping up to and including 8” in diameter if such pipe sizing is necessary to satisfy hydraulic calculation requirements for the standpipe system or attached sprinkler system with the specified piping arrangement.

D. The standpipe system shall be hydraulically calculated to provide the flow and pressure required when the standpipe system is supported by local fire department apparatus through the fire department connection. The maximum design pressure allowed at the fire department connection shall be 150 PSI.

E. The standpipe system shall be hydraulically calculated to provide a residual pressure of 100 PSI at the hydraulically most remote outlet. Total system flow rate shall be 500 GPM for the most remote standpipe and 250 GPM for each additional standpipe up to a maximum of 1250 GPM. For buildings protected throughout by an automatic sprinkler system, the maximum flow rate may be calculated at 1000 GPM.

F. Provide an additional hose connection at the top of the hydraulically most remote standpipe for testing purposes in compliance with NFPA 14, 2003, 7.3.2.2.

G. All hose connections shall be unobstructed in compliance with NFPA 14, 2003, 7.3.1.

H. For new construction, buildings 4 or more stories in height shall be provided with not less than one standpipe for use during construction. Such standpipe shall be installed when the progress of construction is not more than 40 feet. This shall be in compliance with IFC, 2006, 1413.1.

3.14 TESTING AND FLUSHING

A. Contractor shall perform and pay for all tests for the respective systems in accordance with the requirements of this Specification and all of the applicable governing codes.

B. All authorities having jurisdiction, including insurance company, shall be notified by the Division 21 Contractor in sufficient time to enable them to be present for each test.

C. Documentation of the underground fire sprinkler piping system testing and acceptance procedures shall be the responsibility of the Division 21 fire protection contractor. This shall be true whether or not the Division 21 contractor installs the underground piping. If the Division 21 contactor is not the installing contractor, the Division 21 contactor shall be responsible to make the proper arrangements with the installing contractor to ensure the required testing is performed and documented. The testing and documentation shall include:

1. System flushing in accordance with NFPA 13, 2010, 10.10.2.1.1.
2. Hydrostatic testing in accordance with NFPA 13, 2010, 10.10.2.2.1. If any leaks are found during the test, the system must be retested after the leaks have been corrected by the underground water / fire service installing contractor.

3. Test all installed backflow prevention assemblies in accordance with NFPA 13, 2010, 24.2.5.1.
4. Furnish Contractors Underground Material and Test Certificate, to Architect/Engineer upon completion of all required tests.

D. Documentation of the above ground piping system testing and acceptance procedures shall be the responsibility of the Division 21 fire protection contractor; shall be in accordance with NFPA 13, chapter 24. The testing and documentation shall include:
1. System operational tests in accordance with NFPA 13, 2010, 24.2.3.
2. Hydrostatic testing in accordance with NFPA 13, 2010, 24.2.1.1. If any leaks are found during the test, the system must be retested after the leaks have been corrected.
3. Test all installed backflow prevention assemblies in accordance with NFPA 13, 2010, 24.2.5.1.
4. Furnish Contractors Aboveground Material and Test Certificate, to Architect/Engineer upon completion.

E. Documentation of the standpipe testing and acceptance procedures shall be the responsibility of the Division 21 fire protection contractor; shall be in accordance with NFPA 14, 2003, Chapter 11. The testing and documentation shall include:
1. Flush standpipe piping in accordance with NFPA 14, 2003, 11.2.
2. Hydrostatic testing in accordance with NFPA 14, 2003, 11.4.1. If any leaks are found during the test, the system must be retested after the leaks have been corrected.
3. Flow testing in accordance with NFPA 14, 2003, 11.5.
4. Manual Valve testing in accordance with NFPA 14, 2003, 11.6.
5. Pressure regulating devices shall be tested in accordance with NFPA 14, 2003, 11.5.6.
6. Furnish Contractors Standpipe Aboveground Material and Test Certificate, to Architect/Engineer upon completion.

F. Conduct all additional tests, as necessary or required by the authority having jurisdiction, to verify that the systems, equipment and supervisory devices are completely operational and functioning correctly.

G. Division 21 Contractor is responsible for maintaining the equipment in service after the acceptance test as well as minimizing impairments to the system for the remainder of the project.

H. The underground fire service piping system testing and acceptance procedures shall be performed by the Division 21 contractor in accordance with NFPA 13, chapter 10. Division 21 is responsible to make all necessary corrections as required if leaks are found during testing.

3.15 FIRE EXTINGUISHERS

A. All fire extinguishers and extinguisher cabinets provided under Division 10.

3.16 FIRE WATER SERVICE

A. Provide reaction blocking, or other approved joint restraint, at all changes in direction for underground ductile iron water service and/or fire service piping. Sizing and installation shall comply with procedures described in AWWA Standard C600.

END OF SECTION

SECTION 220513 - ELECTRIC MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single phase and three phase electric motors.

1.02 RELATED DOCUMENTS

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

B. Section 223000 – Plumbing Equipment.

C. Section 262726 – Wiring Devices.

1.03 REFERENCES

A. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2006.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Operation Data: Include instructions for safe operating procedures.

C. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

A. Comply with requirements of Division 1.

PART 2 PRODUCTS

2.01 ELECTRIC MOTOR GENERAL CONSTRUCTION AND REQUIREMENTS

A. Furnish electric motors as required for each motor driven unit. All motors must conform in every respect to the standard specifications of NEMA and bear nameplate of manufacturer, with current operating characteristics noted thereon. Motors shall be U.L. approved.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. All electric motors shall be sized to meet the horsepower requirements of the driven unit at design characteristics including all V-belt and/or drive and coupling losses which are incurred without loading the motor beyond its nameplate horsepower rating. Where V-belt drives are employed, the motor horsepower nameplate ratings shall not be less than 115% of the driven unit brake horsepower requirements.

D. All motors shall be provided with ball roller bearings, and shall have provisions for lubrication unless specified otherwise. Motors shall be quiet when operating under full load operations. See schedules on the Mechanical/Electrical (ME) drawings for capacities.

E. Single phase motors shall be capacitor start, drip-proof. Three phase motors general purpose, squirrel cage induction type unless specified otherwise. Minimum service factors shall be 1.15. All motors single speed, 1750 rpm, unless specified otherwise for specific equipment.

F. Electric motor characteristics shall be as indicated on the drawings.

G. All three phase motors for mechanical equipment rated 1 horsepower and larger shall meet NEMA Premium Efficiency standards as shown on the following table. Motors shall be labeled to comply with NEMA Standard MG1-12.53 with the nominal efficiency printed on the nameplate. Efficiency to be based on a dynamometer test per IEEE, Standard 112, Method B.
   1. Minimum efficiency shall be provided per schedule.

MOTOR SCHEDULE

	Open Drip-Proof (ODP)			Totally Enclosed Fan-Cooled (TEFC)		
	1200 RPM	1800 RPM	3600 RPM	1200 RPM	1800 RPM	3600 RPM
HP						
1	82.5	85.5	77	82.5	85.5	77
1.5	86.5	86.5	84	87.5	86.5	84
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check line voltage and phase and ensure agreement with nameplate.

3.02 WIRING

A. All 120V and low voltage control wiring for equipment provided by this Contractor shall be responsibility of this Contractor unless specified otherwise and clearly stated.

B. Electrical work shall comply with the requirements of the current applicable National Electrical Code and Division 26. Where this specification or the plans indicate requirements in excess of those of NEC, the compliance with NEC will not relieve the Contractor from furnishing and installing work as shown or specified.

C. All switching, protective devices and controls for equipment furnished under these Specifications shall be identified with black-white-black laminated 1/8" plastic plates. Plates shall be attached with self-tapping screws.

END OF SECTION

SECTION 220519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

C. Pressure and temperature test stations.

D. Domestic water meter.

1.02 RELATED DOCUMENTS

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

B. Section 221005 - Plumbing Piping.

C. Section 220993 – Plumbing Sequence of Operations

1.03 REFERENCES

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.

B. ASTM E 1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2003a.

C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers; 2005 (Reapproved 2003).

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Gauge: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass wells, with front recalibration adjustment, black scale on white background.

1. Dial: 4-1/2" (6" if installed 15' above floor) black on white, red tip pointer.

2. Case: Aluminum, clear glass window.

3. Bourdon Tube: Bronze, silver brazed.

4. Movement: Brass-bronze brushed-rotary type.
5. Scale: PSI

B. Range

1. One and one half (1-1/2) times the maximum system pressure.

C. Acceptable Manufacturers:

1. Weiss
2. March
3. Trerice
4. U S Gauge
5. Weksler

2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Brass tee handle, 1/4 inch connections, rated for maximum pressure of 200 psig and maximum temperature of 500 degrees F.

B. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.

2.03 THERMOMETERS

A. Thermometer:

1. Case: Aluminum, 9", clear plastic or glass window.
2. Scale and Tube: Black on white, red reading.
3. Stem and Well: Angle adjustable stem, separable well, with extended neck where required for insulated piping.

B. Range

1. Plumbing 30 degrees F to 240 degrees F

C. Acceptable Manufacturers:

1. Weiss
2. March
3. Trerice
4. U S Gauge
5. Weksler

2.04 THERMOMETER WELLS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Well: Separable well, with extended neck where required for insulated piping.

2.05 PRESSURE AND TEMPERATURE TEST STATIONS

A. “Pete’s Plug”, a 1/4 inch MPT fitting, to receive either a temperature or pressure probe, 1/8 inch O.D. Fitting shall be solid brass with valve core of Nordal (maximum 275 degree F.) fitted with a gasketed cap and rated at 1000 psig.

B. Supply Owner with pressure gauge adapters with 1/8 inch O.D. probe, two (2) pressure gauges for each range required, four (4) 5 inch stem pocket testing thermometers; two (2) 25 – 125 degree F. for chilled water and two (2) 50 – 500 degree F. for hot water. Provide carrying case for gauges and thermometers.

2.06 WATER METER

A. Provide a water meter obtained from and/or approved by the City or local municipality, of a type and size as required for the GPM maximum flow, at a maximum pressure loss of in PSI. The contractor shall be responsible for the GPM and PSI requirements.

2.07 IRRIGATION METER

A. Provide a water meter obtained from and/or approved by the City or local municipality, of a type and size as required for the GPM maximum flow, at a maximum pressure loss of in PSI. The contractor shall be responsible for the GPM and PSI requirements.

PART 3 EXECUTION

3.01 PRESSURE GAUGES

A. Install pressure gauges in accordance with manufacturer's instructions.

B. Pressure gauges shall read one and one-half (1-1/2) times system pressure.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples to allow clearance from insulation.

D. Install pressure gauges and in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust pressure gauges to final angle, clean windows and lenses, and calibrate to zero.

F. Provide pressure gauges where indicated on drawings and at the following locations:

1. Water main service entrance after the meter or building backflow preventer
2. Pumps - suction and discharge.
3. Pressure reducing valves (upstream and downstream).
4. Domestic water booster system suction and discharge.
5. Water softener system outlet.

3.02 THERMOMETERS

A. Install thermometers in accordance with manufacturer's instructions.

B. Install thermometers in piping systems in wells.

C. Install thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

D. Adjust thermometers to final angle, clean windows and lenses, and calibrate to zero.

E. Provide thermometers where indicated on drawings and at the following locations:

1. Water heater, hot water outlet.
2. Recirculating return, highest level

3.03 WATER METERS

A. Verify installation requirements with municipality.

B. Provide support brackets as needed and shut off valves on each side of meter.

C. Insulate meter body and provide access to totalizer cover.

D. Perform flow test to verify meter is operational.

E. Water meters located within 5 feet of a plumbing fixture shall be shielded from contamination.

END OF SECTION

SECTION 220523 - GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Valve accessories:
   1. Ball valves.
   2. Gate valves.
   3. Butterfly valves.
   4 Balance valves.
   5. Check valves.

1.02 RELATED DOCUMENTS

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

B. Section 220519 – Meters and Gauges for Plumbing Piping.

C. Section 220529 – Hangers and Supports for Plumbing Piping and Equipment.

D. Section 220553 – Identification for Plumbing Piping and Equipment.

E. Section 220719 – Plumbing Piping Insulation.

F. Section 221005 – Plumbing Piping.

G. Section 221006 – Plumbing Piping Specialties.

H. Section 223000 – Plumbing Equipment.

I. Section 224000 – Plumbing Fixtures.

1.03 REFERENCES

A. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide data on valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of all valves and note on drawings any deviations from the contract documents.

1.05 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

PART 2 PRODUCTS

2.01 BALL VALVES

A. Pipe sizes 4 Inches and smaller: Bronze body 400 psi WOG full port ball valve, lever handle, chrome plated bronze or stainless steel ball, Virgin TFE seat, Virgin TFE stuffing box seal, soldered ends.

B. Acceptable Manufacturers:
   1. Apollo 77-200 Series
   2. Nibco, Inc. T-585-70-66
   3. Milwaukee BA-450.
   4. Watts B6081

2.02 GATE VALVES

A. Pipe size to 3".
   1. 125# gate with bronze body, rising stem, solid disc, threaded ends.
   2. Acceptable Manufacturers:
      a. Stockham B-105
      b. Millwaukee 1152
      c. Nibco T-111.
      d. Jomar T301.

B. Pipe size to 3".
   1. 125# gate with bronze body, rising stem, solid disc, soldered ends.
   2. Acceptable Manufacturers:
      a. Stockham B-120
      b. Milwaukee 149
      c. Nibco S-111

C. Pipe Sizes 3” and Larger:
   1. 150#, ductile gate, with O.S. & Y, solid wedge disc, bolted bonnet, flanged.
   2. Acceptable Manufacturers:
      a. Stockham Fig. D-623
      b. Milwaukee F-2885
      c. Wilkins Series 48

2.03 BUTTERFLY VALVE

A. Pipe sizes 2-1/2” and larger. Cast iron butterfly valve with extended neck for insulation, 316 stainless steel shaft and disc, EPDM seat and shaft seals capable of bubble tight shutoff at 150 psi differential. Lever operators shall be used on valves less than 6”, gear operated on valves 6” and larger. Tapped lug body shall be used.

B. Acceptable Manufacturers:
   1. Mueller

2.04 STOP AND WASTE VALVES

A. Construction, 400 psi CWP, brass, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with drain outlet on non-pressure side.

B. Acceptable Manufacturers:
   1. Apollo Series 95-100
   2. Watts B6301
   3. Jomar (S or T) 100 STN

2.05 DRAIN VALVES

A. Construction, 200 psi, bronze ball valve 1/2 or 3/4 inch threaded inlet, 3/4 inch hose threaded outlet.

B. Acceptable Manufacturer:
   1. Apollo Series 78-100.
   2. Watts B-600-CC.
   3. Nibco T-585-70-66-HC
   4. Jomar (T or S) 100 H

2.06 BALANCE VALVES

A. 125 lb. and less
   1. Globe valve for balancing and positive shut off, nonferrous metal capable of positive shutoff, with multi-turn adjustment for maximum balance and tamperproof memory stop. Position display window on handwheel.
   2. Pressure/temperature readout ports for measurement through a portable meter.
   3. Meter - Compatible with balance valve. Portable computerized with quick connections capable of reading flow measurements in gpm.

B. Acceptable Manufacturers:
   1. Tour Andersson - STAS
   2. Nibco 1710 Series thru 2”
   3. Mepco MPV Series

2.07 CHECK VALVES

A. Pipe sizes 3 inch and smaller Class 125, bronze body, bronze disc, renewable seat.

B. Acceptable Manufacturers:
   1. Stockham B-309Y or B-319Y.
   2. Nibco T-413B or S-413B.
   3. Milwaukee Model 508.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

B. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Division 1.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hangers and Supports.

1.02 RELATED DOCUMENTS

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

B. Section 220523 – General Duty Valves for Plumbing Piping.

C. Section 220719 – Plumbing Piping Insulation.

D. Section 221005 – Plumbing Piping.

E. Section 221006 – Plumbing Piping Specialties.

F. Section 223000 – Plumbing Equipment.

G. Section 224000 – Plumbing Fixtures.

1.03 REFERENCES

A. ASME B31.9 – Building Services Piping; The American Society of Mechanical Engineers; 2008.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide data on hangers and supports. Provide manufacturers catalog information.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. All individual pipes shall be supported with adjustable clevis hangers, where required size to encompass insulated pipe.
   1. Anvil Fig. 260, or approved equal.
   2. Anvil Fig. CT-65, or approved equal (uninsulated copper pipe).

C. "Trapeze" hangers shall be Unistrut or B-Line channels, for piping 3" and smaller. For piping 4" to 6" use 2" x 2" x 1/4" angle iron, for piping 8" to 12" use 3" x 3" x 3/8" angle iron using

the appropriate diameter rod that will sufficiently support the weight of all of the pipe and their contents being supported and nutted on both sides of the iron.

D. Hanger Rods, etc.: Mild steel continuous threaded rod, heavy washers and heavy hex nuts.

2.02 ATTACHMENTS TO STRUCTURE

A. Concrete
   1. Poured - for loads between 400 lbs. and 1140 lbs.
      a. Anvil Fig. 282.
   2. Poured - For loads up to 400 lbs.
      a. Anvil Fig. 285 or U channel type; B - Line B221 or Unistrut.
   3. Precast - Tapered wedge with locking sleeve: Quick Bolt.

B. Steel Beam Structure
   1. Beam Clamp
      a. For loads up to 1070 lbs. - Anvil Fig. 94, or approved equal.
      b. For loads up to 470 lbs. - Anvil Fig. 93, or approved equal.
   2. Welded beam attachment - Anvil Fig. 66.
   3. Steel washer and heavy nut for split joists.
   4. Angle or channel iron support spanning between beams and joists.

C. Wood
   1. Drill and use through bolts nutted on both sides of joist and malleable iron eye sockets.

2.03 HANGER INSERTS

A. Concrete inserts for loads between 400 and 1140 lbs.
   1. Anvil Fig. 282, or approved equal.

B. Concrete inserts for loads up to 400 lbs.
   1. Anvil Fig. 285, or approved equal.

2.04 VERTICAL PIPE SUPPORTS

A. All vertical piping shall be supported at each floor using riser clamps.
   1. Anvil Fig. 261 (cast iron, steel, and insulated copper pipe).
   2. Anvil Fig. CT 121 (uninsulated copper pipe).

2.05 SHEET METAL SHIELDS

A. Sheet metal shields shall be Anvil Fig. 167 or galvanized sheet metal of equal gauge thickness.

2.06 ACCEPTABLE MANUFACTURER:

A. Anvil

B. Felker

C. Hycon

D. Piping Tech.

E. Unistrut

F. B-Line

G. Superstrut

H. Michigan\Erico

I. Holdrite

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 220719.

B. Provide all hangers and supports as required.

3.02 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Whenever copper piping comes directly in contact with steel support system, it shall be this Contractor's responsibility to wrap the pipe with two layers of 3M's #33 electrolytic tape. The length of tape shall be such to provide 2" overlap on each side of support
9. Support cast iron drainage piping at every joint.
10. Insulated pipe support shall be supported with polysiocyanurate pipe insulation the same thickness as insulated pipe. Install between pipe and vapor barrier.
11. Supports shall be sized for weights and pipe sizes encountered.
12. Supports shall properly compensate for all thermal expansion and contraction.

B. Horizontal Hanger Spacing Schedule

1. Steel Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter

1/2" tube only	5'	1/4"
1/2" - 1"	7'	3/8"
1-1/4" - 1-1/2"	9'	3/8"
2"	10'	1/2"
2-1/2"	11'	1/2"
3"	12'	1/2"
4"	14'	5/8"
5"	16'	5/8"
6" and larger	17'	3/4"

2. Copper Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
1/2"	6'	3/8"
3/4"	6'	3/8"
1"	6'	3/8"
1-1/4"	6'	3/8"
1-1/2"	9'	3/8"
2"	9'	3/8"
2-1/2"	10'	1/2"
3"	10'	1/2"
3-1/2"	10'	1/2"
4"	10'	1/2"

3. Cast Iron Storm, Waste and Vent Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
1/4" to 1-1/2"	5'	3/8"
2"	5'	3/8"
2-1/2"	5'	3/8"
3"	5'	3/8"
4"	5'	3/8"
5"	5'	5/8"
6" to 12"	5'	5/8"

Note: 10' hanger spacing may be used for piping in 10 foot lengths.

3.03 VERTICAL PIPE SUPPORTS

A. Cast-iron soil pipe, at base and at each story height. Neoprene jointed pipe at five foot intervals, except where ten foot lengths are used.

B. Threaded pipe, every other story height.

C. Copper tubing, at each story.

D. Exposed plastic pipe, 1-1/4 inch and 1-1/2 inch sizes, at four foot intervals.

E. Concealed plastic pipe and exposed plastic pipe two inch and over, at each story.

3.04 BRACKETS, BRACES AND SUPPORTS

A. Provide brackets, braces or reinforcing angles as may be required in all partitions, not sufficient in themselves to support fixtures or other wall mounted equipment included in this specification.

B. Pipe shall be supported from the building structure independently or from a separate support, no pipe line shall be supported from another pipe line or piece of equipment.

C. No equipment shall be supported by the piping system itself. All units shall be supported in a manner to allow service without removing large piping segments or valves. Provide structural members as required.

D. On thin masonry or hollow tile walls that are to be finished on opposite side of wall, use 3/8" brass through bolts extended entirely through wall with 3" cut washer on opposite side of wall. Bolt heads and washers shall be concealed under wall finish on opposite side of wall. On walls of accessible pipe spaces, use 3/8" brass through bolts and 3" cut washers exposed in pipe spaces.

E. On brick, masonry block, hollow tile or concrete walls not finished on opposite side of wall, use brass toggle bolts or 3/8" brass bolts extending at least 3" into wall secured in place lead inserts and caulked with silicone type caulk.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Labels.

1.02 RELATED DOCUMENTS

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

B. Section 220519 – Meters and Gauges for Plumbing Piping.

C. Section 220523 – General Duty Valves for Plumbing Piping.

D. Section 221005 – Plumbing Piping.

E. Section 221006 – Plumbing Piping Specialties.

F. Section 223000 – Plumbing Equipment.

G. Section 224000 – Plumbing Fixtures.

1.03 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide manufacturer’s catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

D. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation.

B. Champion America, Inc.

C. Seton Identification Products.

2.02 IDENTIFICATION – EQUIPMENT NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/2 inch.
   3. Background Color: Black.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 IDENTIFICATION - PIPE

A. Color: Conform to ASME A13.1.

B. Plastic Tape Pipe Labels: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Pipe: Labels shall describe the contents and direction of flow. Labels shall be secured to pipe with full self-adhesive banding around pipe at each end of label. Labels shall be per the schedule in Part 3.

2.05 IDENTIFICATION – VALVES

A. Colored plastic with 1/2" white letters such as Bakelite attached with a brass chain.

B. Control valves shall be tagged as to service and normal position.

C. Other valves tagged as to service and function.

D. Control valve tags shall have black background, other valves tags shall have colors corresponding to service described above.

2.06 IDENTIFICATION - EQUIPMENT

A. Black plastic with 1" white letters such as Bakelite attached with screws to equipment for its labeling.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion-resistant chain.

C. Install pipe labels in accordance with manufacturer's instructions.

D. Install pipe labels complete around pipe in accordance with manufacturer's instructions.

E. Identify pumps, and tanks with nameplates. Small devices, such as in-line pumps, may be identified with tags.

F. Identify valves in main and branch piping with tags. Valve list shall be included in Operation and Maintenance Manual.

G. Identify piping, concealed or exposed, with pipe labels. Use tags on piping 3/4 inch diameter and smaller. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 50 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

3.03 PIPE IDENTIFICATION SCHEDULE

CONDENSATE DRAIN	Y/B
DOMESTIC COLD WATER	G/W
DOMESTIC HOT WATER	Y/B
RECIRCULATING HOT WATER	Y/B
NON - POTABLE WATER	Y/B
POTABLE WATER	Y/B
RAIN WATER	G/W
SANITARY DRAIN	G/W
SANITARY SEWER	G/W
SANITARY VENT	G/W

Y/B =YELLOW BACKGROUND/ BLACK LETTERS
G/W = GREEN BACKGROUND/ WHITE LETTERS
R/W = RED BACKGROUND/ WHITE LETTERS
B/W = BLUE BACKGROUND/ WHITE LETTERS

Pipe Size	Band Width	Letter Height
1/2" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
10" & UP	32"	3-1/2"

END OF SECTION

SECTION 220716 - PLUMBING EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Equipment insulation.

B. Covering.

1.02 RELATED DOCUMENTS

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

B. Section 220553 - Identification for Plumbing Piping and Equipment.

C. Section 221005 - Plumbing Piping.

D. Section 223000 – Plumbing Equipment

1.03 REFERENCES

A. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2005.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.

C. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

D. NFPA 225 Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

E. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc; 2003

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Acceptable Manufacturers:
   1. Knauf Insulation.
   2. Johns Manville Corporation.
   3. Owens Corning Corp.
   4. CertainTeed Corporation.
   5. Armaflex

2.01 TYPE 1 - FOAM PLASTIC TUBULAR AND SHEET INSULATION

A. Flexible elastomeric material with 3/4" thickness designed for varied services at temperatures between -40 degrees F and 220 degrees F.

B. Fittings for piping shall be insulated with mitered segments which match the material used. All butt joints shall be joined by sealing with a waterproof vapor barrier adhesive as recommended by the insulation manufacturer.

C. When applying sheet insulation to metal surfaces, brush on a coat of adhesive to the clean, dry metal, covering an area to the size of one sheet. Apply a brushcoat of adhesive to the back of the sheet, except for 1/2" wide border around the edges. After adhesive is on the metal surface and the sheet has dried to a non-sticky state, position sheet so that the edges overlap the previously installed sheets by 1/8". Apply light pressure to adhere a spot in the center of the sheet only and compress butt edges into place. Bond sheet by pressing firmly into place. Spread joints and coat with adhesive. DO NOT FILL JOINT WITH ADHESIVE.

D. For outdoor application, apply two coats of finish as recommended by the insulation manufacturer.

E. Acceptable manufacturers:
   1. AP / Aramaflex 25/50 – Armacell International

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Install insulation materials with smooth and even surfaces and on clean, dry surfaces. Redo poorly fitted joints. Do not use mastic or joint as filler for gapping joints and voids resulting from poor workmanship. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

D. Do not apply insulation to equipment while hot.

E. Cover insulated surfaces with glass cloth jacketing neatly fitted and firmly secured. Lap seams at least two inches.

F. Do not insulate handholes, cleanouts, ASME stamp and manufacturer’s nameplate. Provide neatly leveled edge at interruptions of insulation.

G. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Roof Drain Bodies and Water Meters - All surfaces of the roof drain body and water meters shall be insulated with 3/4" thick insulation as described by Type 1, Part 2 - Products.

END OF SECTION

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED DOCUMENTS

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

B. Section 220529 – Hangers and Supports for Plumbing Piping and Equipment.

C. Section 221005 - Plumbing Piping.

D. Section 224000 - Plumbing Fixtures.

1.03 REFERENCES

A. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2005.

B. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2006.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.

D. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2003.

G. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Acceptable Manufacturers:
   1. Knauf Fiber Glass.
   2. Johns Manville Corporation.
   3. Owens Corning Corporation.
   4. CertainTeed Corporation
   5. Armaflex

2.02 TYPE 1 - FIBERGLASS PIPE & FITTING INSULATION

A. Pipe
   1. Preformed fiberglass with Kraft reinforced foil vapor barrier jacket suitable for painting, with a maximum thermal conductivity of K = .25 Btu in./hr. sq. ft. at 75 degrees F and rated for 0 degrees F to +850 degrees F service.

B. Fittings
   1. Pre-molded one-piece PVC insulated fitting covers with fiber glass insulation inserts shall be provided on all valves, strainers, elbows, tees, and fittings, etc. Insert shall have a maximum thermal conductivity of K = .28 Btu in./hr. sq. ft. and rated for 0 deg. to 450 degrees.

C. Application
   1. Insulate all piping in a neat, workmanlike fashion in accordance with thickness listed. Longitudinal laps of jackets shall be sealed and butt joints shall be wrapped with a 3" minimum wide strip of the jacketing material securely sealed in place.
   2. In lieu of the above method of application for AP jackets, contractor may elect to use factory-applied pressure sensitive laps and butt strips.
   3. Domestic cold water, domestic hot water, domestic recirculated hot water, tempered water, and rain water conductors shall be insulated as above and have all seam edges of the cover sealed with vapor-barrier adhesive mastic. The circumferential edges of the cover shall be wrapped with vapor-barrier pressure-sensitive color-matching tape. The tape shall extend over the adjacent pipe insulation and have an overlap on itself at least two inches on the downward side.
   4. Pre-molded insulated fitting covers shall be factory precut and insulation shall be applied to the fitting. The ends of the insulation shall be tucked snugly into the throat of the fitting and the edges adjacent to the pipe covering tufted and tucked in fully insulating the

pipe fitting. The one-piece PVC fitting cover will be secured by banding or taping the ends to the adjacent pipe covering. On fittings where the operating temperature exceeds 250 degrees F or where the pipe insulation thickness is greater than 1-1/2", two or more layers of the insulation inserts shall be applied prior to the installation of the PVC fitting cover.

5. Fittings on small pipes 1-1/2" and smaller may be insulated using mitered insulation at the fittings joined with foil faced pressure sensitive tape and 4 oz. canvas jacket.

2.03 TYPE 3 - PIPING JACKETS

A. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   1. Minimum Service Temperature: 0 degrees F.
   2. Maximum Service Temperature: 150 degrees F.
   3. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96.
   4. Thickness: 10 mil.
   5. Connections: Brush on welding adhesive.

B. Covering Adhesive Mastic:
   1. Compatible with insulation.

2.04 TYPE 4 - PIPING SAFETY JACKETS

A. Provide products that comply with the following:
   1. Americans with Disabilities Act (ADA), Article 4.19.4.
   2. ANSI/ICC A117.1, American National Standard for Accessible Buildings and Facilities.
   3. Requirements of applicable building code.

B. Piping Safety Covers:
   1. Characteristics: Three-piece molded assembly, minimum 1/8 inch wall thickness, with internal ribs to provide air space between piping and piping insulation jacket, molded to receive manufacturer's snap-clip fasteners.
   2. Vinyl Material: Impact-resistant and stain-resistant molded closed-cell anti-microbial vinyl compound, UV-stable, non-fading, non-yellowing; having the following performance characteristics:
      a. Burning Characteristics: 0 seconds Average Time of Burning (ATB), 0 mm Area of Burning (AEB), when tested in accordance with ASTM D 635.
      b. Thermal Conductivity: K-value 1.17, when tested in accordance with ASTM C 177.
      c. Indentation Hardness: 60, minimum, when tested in accordance with ASTM D 2240, using Type A durometer.
   3. Trap Assembly Cover: Three-piece assembly, with removable clean-out nut enclosure.
   4. Angle Stop Covers: Formed with hinged cap for access to valve without requiring cover removal.
   5. Configurations: In accordance with manufacturer's product data for project piping configurations indicated on drawings.
   6. Color: China White, gloss finish; paintable.
   7. Fasteners: Manufacturer's standard re-usable snap-clip fasteners; wire-tie fasteners not permitted.
   8. Acceptable Manufacturers:
      a. Truebro Lav-Guard 2

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert material: Hydrous calcium silicate insulation as described by Type 2 in Part 2 – Products, suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, comply with Division 7 firestopping.

3.03 SCHEDULES

A. Domestic Hot and Cold Water, Recirculating Hot Water, Tempered Water
   1. All piping & fittings shall be insulated with 1" thick fiberglass as described by Type 1 in Part 2 - Products.

B. Rainwater
   1. All piping shall be insulated with 1" thick fiberglass as described by Type 1 in Part 2 - Products.

C. Piping Jacket
   1. All exposed piping including tunnels, except in mechanical rooms, shall be covered with piping jacket as described by Type 3 in Part 2 - Products.

D. Pipe Safety Covers
   1. For all lavatory and kitchen hand wash sinks the exposed cold and hot water supply and waste pipes shall be insulated with pipe safety covers as described by Type 4 in Part 2 – Products.

END OF SECTION

SECTION 220993 - SEQUENCE OF OPERATIONS FOR PLUMBING PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sequence of operation for:

1. Domestic Water Recirculating Pump.
2. Domestic Water Pressure Pump.

1.02 RELATED DOCUMENTS

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

1.03 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections including 220519.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire system and each piece of equipment.

1. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures.
2. Include at least the following sequences:
    a. Start-up.
    b. Normal operating mode.
    c. Unoccupied mode.
    d. Shutdown.
    e. Capacity control sequences and equipment staging.
    f. Detailed sequences for all control strategies.
    g. Sequences for all alarms and emergency shut downs.
    h. Interactions and interlocks with other systems.
3. Include initial and recommended values for all adjustable settings, set points and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

5. Include operating schedules.

C. Hand-Off-Auto function: HOA switch may be provided by the equipment manufacturer, by Division 26, or as part of a speed control unit (VFD).

1. When furnished integral with equipment, manufacturer shall determine HOA functionality.
2. When HOA function is provided with the VFD, or is furnished and installed by Division 26:
    a. In Hand position, system shall be under manual control.
    b. In Off position, system shall be in the Safety default position.
    c. In Auto position, system shall be under the control of the BMCS.

D. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

1. Label with settings, adjustable range of control and limits.
2. Include flow diagrams for each control system, graphically depicting control logic.
3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Include preliminary graphic displays indicating mechanical system components, control system components, and controlled function status and value.
5. Include a key to abbreviations.

E. Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DOMESTIC WATER RECIRCULATING PUMP

A. Domestic Water Recirculating Pump

1. Aquastat starts pump on temperature drop below set point (110 degrees F, variable).

3.02 DOMESTIC WATER PRESSURE PUMP

A. Domestic Water Booster Pump

1. Pressure sensor starts the pump when the pressure is below 70 PSI. The pump shall stop, when the pressure sensor reaches 80 PSI.

END OF SECTION

SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings for:
   1. Water service.
   2. Domestic water.
   3. Sanitary sewer.
   4. Sanitary vent.
   5. Kitchen sanitary waste.
   6. Storm water.
   7. Deck drainage collector piping.

B. Miscellaneous accessories:
   1. Pipe sleeves.
   2. Link seals.
   3. Escutcheon plate.
   4. Unions and flanges.
   5. Strainers.

1.02 RELATED DOCUMENTS

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

B. Section 078413 – Penetration Firestopping.

C. Section 220519 – Meters and Gauges for Plumbing Piping.

D. Section 220523 – General Duty Valves for Plumbing Piping.

E. Section 220529 – Hangers and Supports for Plumbing Piping and Equipment.

F. Section 220553 – Identification for Plumbing Piping and Equipment.

G. Section 220719 – Plumbing Piping Insulation.

H. Section 221006 – Plumbing Piping Specialties.

I. Section 223000 – Plumbing Equipment.

J. Section 224000 – Plumbing Fixtures.

1.03 REFERENCES

A. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

D. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; 1988.

E. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2004 (ANSI/ASME B31.9).

F. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2004a.

G. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; latest edition.

H. ASTM A 234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2004.

I. ASTM A 888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; latest edition, including annex A1.

J. ASTM B 32 - Standard Specification for Solder Metal; 2004.

K. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2002.

L. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.

M. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.

N. ASTM D 2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems; 2004.

O. ASTM D 2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2004a.

P. ASTM D 2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2002).

Q. ASTM D 3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2004a.

R. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005

ANSI/AWWA C651).

S. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2005 edition.

T. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; latest edition.

1.04 DESCRIPTION OF WORK

A. Furnish complete piping systems for the following:
   1. Potable water.
   2. Sanitary waste.
   3. Sanitary vent.
   4. Storm drainage.

B. Provide all hangers and supports as required.

C. Make connections to all equipment, fixtures and devices.

1.05 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturers catalog information.

1.06 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.

B. Welders Certification: In accordance with ASME (BPV IX).

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY WASTE

A. Underground (Within building to 5'-0" from building)

   1. Pipe - No-hub, cast iron, service weight, ASTM A888 and CISPI 301
   2. Fittings - No-hub, cast iron, DWV, ASTM A888 and CISPI 301

3. Joints - Elastomeric sleeve, stainless cover, stainless clamps, ASTM C1277 and CISPI 310

B. Above Ground

1. Pipe - PVC, ASTM D2665 or ABS ASTM D2661
2. Fittings - PVC or ABS, socket type, DWV, NSF Standard 14
3. Joints - Solvent weld. PVC joints shall be prepared with contrasting color primer.

2.02 SANITARY VENT

A. Aboveground - Within building

1. Pipe - PVC, ASTM D2665 or ABS ASTM D2661
2. Fittings - PVC or ABS, socket type, DWV, NSF Standard 14
3. Joints - Solvent weld. PVC joints shall be prepared with contrasting color primer.

2.03 STORM

A. Underground (Within building to 5'-0" from building)

1. Pipe - No-hub, cast iron, service weight, ASTM A888 and CISPI 301
2. Fittings - No-hub, cast iron, DWV, ASTM A888 and CISPI 301
3. Joints - Elastomeric sleeve, stainless cover, stainless clamps, ASTM C1277 and CISPI 310

B. Above Ground

1. Pipe - PVC, ASTM D2665 or ABS ASTM D2661
2. Fittings - PVC or ABS, socket type, DWV, NSF Standard 14
3. Joints - Solvent weld. PVC joints shall be prepared with contrasting color primer.

2.04 DOMESTIC WATER SERVICE

A. Underground - (From 5'-0" outside of building)

1. Pipe - Ductile iron, ANSI A21.51 (AWWA C151)
2. Fittings - Ductile iron
3. Joints - Mechanical with threaded rod flange and rubber gasket

B. Underground - (5’-0” outside of building to 6” above floor at service entrance)

1. Pipe - Ductile iron, ANSI A21.51 (AWWA C151)
2. Fittings - Ductile iron
3. Joints - Mechanical with threaded rod flange and rubber gasket

2.05 DOMESTIC WATER SYSTEM (WITHIN BUILDING) - COPPER

A. Hot, Cold Distribution, Recirculating Hot Water, Tempered Water

1. Pipe - Copper, Type L, ASTM B88, hard drawn, soft drawn may be used next to fixtures
2. Fittings - Wrought copper, brass or cast bronze
3. Joints - Screwed or pressure type with 95/5 solder and non-corrosive flux

2.06 RELIEF PIPING AND KITCHEN INDIRECT WASTE PIPING

A. Pipe - Copper, Type M, hard drawn

B. Fittings - Cast bronze or wrought copper

C. Joints - Pressure type with 95/5 solder

2.07 POOL DECK DRAINAGE COLLECTOR PIPING AND FITTINGS

A. Pipe - PVC, ASTM D2665 or ABS ASTM D2661
B. Fittings - PVC or ABS, socket type, DWV, NSF Standard 14
C. Joints - Solvent weld. PVC joints shall be prepared with contrasting color primer.

2.08 PIPE SLEEVES

A. Floor sleeves shall be uncoated or galvanized steel pipe not less than Schedule 40.

B. Sleeves in rated walls shall be as required for U. L. listing.

C. Temporary sleeves in poured concrete walls or floors shall be poly-sleeve with nailing flange.

2.09 EXTERIOR WALL LINK SEALS

A. Modular type consisting of synthetic rubber links with threaded rods and nuts. Temperature rating -40 to 250 degrees.

B. Acceptable Manufacturer:
1. Link Seal, Thunderline Corporation

2.10 FLOOR, WALL AND CEILING ESCUTCHEON PLATES

A. Escutcheon plates shall be at least 1/32" thick and shall be equipped with set screws for locking around pipe. Plates shall be finished steel chromium plated.

2.11 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 2 Inches and Under:
1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes 2-1/2 Inches and Larger:
1. Ferrous pipe: ASTM A 181, Class 150 forged steel slip-on weld flanges; preformed neoprene gaskets.
2. Copper pipe: Class 150 companion bronze flanges; preformed neoprene gaskets.

2.12 DIELECTRIC UNIONS AND FLANGES

A. All 2” and smaller copper piping connections to a dissimilar metal shall be made with insulated type dielectric unions or flanges.

B. All 2-1/2” and larger copper piping connections to a dissimilar metal shall be made with insulated dielectric flange kits. Dielectric flange kit shall consist of a 1/8” phenolic retainer with a Viton sealing ring. Provide one phenolic sleeve and two 1/8” phenolic washers and two 1/8” galvanized steel washers for each bolt.

C. Dielectric flange kits shall be Class 150 rated at 175 psig and conform to ANSI B16.42 and B16.24.

2.13 STRAINERS

A. All strainers shall be Y type cast bronze Class 250 with stainless steel screen.

B. Strainers shall be full line size.

C. Acceptable Manufacturers:
1. Mueller 352M
2. Dunham-Bush
3. Hoffman 420C
4. Armstrong

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

E. Install piping to maintain headroom, conserve space, and not interfere with use of space.

F. Provide a sleeve set with water stop plate at all exterior wall penetrations, sleeve shall be minimum schedule 40 galvanized steel pipe. Sleeve inside diameter shall encompass pipe and link seal. Provide link seal as described in Part 2, Products.

G. Group piping whenever practical at common elevations.

H. Where uncovered, exposed pipes pass through walls, floors or ceilings, they shall be fitted with escutcheon plates. Plates shall be set tight against wall or floor. Plates on other than exposed pipes shall be prime coated.

I. Make connections to all equipment, fixtures and devices.

3.02 DOMESTIC WATER SERVICE

A. Domestic water service is provided by a system of wells, pumps, treatment & storage which is designed by others under separate contract with the Owner. The work of this Section includes connecting to this system at its termination point within the building.

B. Fire suppression water service is provided by a system of wells, pumps, treatment & storage which is designed by others under separate contract with the Owner. Refer to Section 211000

3.03 DOMESTIC WATER DISTRIBUTION

A. Install water piping to ASME B31.9.

B. Provide domestic hot and cold water to all outlets and fixtures as shown on drawings or specified herein.

C. All water piping shall be pitched to drain points and up from hot water tanks, supply mains or risers 1/8" per ten feet wherever possible.
   1. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
   2. Install valves with stems upright or horizontal, not inverted.

D. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

E. Install unions downstream of valves and at equipment or apparatus connections.

F. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

G. Install ball valves for shut-off and to isolate equipment bypass, part of systems, or vertical risers.

H. Provide drain valves at base of all risers and at all low points in piping.

3.04 WASTE AND VENT PIPING

A. The continuous waste and vent piping method shall be followed for the entire plumbing system.

B. All waste and vent piping less than 3” shall be pitched at 1/4" to the foot minimum. Waste and vent piping 3” and larger shall be pitched 1/4" to the foot where possible and 1/8" minimum unless indicated otherwise so that all waste piping will drain back to main stacks and vent pipe will drain back to fixture. Piping shall be properly supported so that it will not sag and form pockets.

C. Double wye drainage fittings shall not be installed in the horizontal position.

D. Install vent piping penetrating roofed areas to maintain integrity of roof assembly. Vent stacks shall be extended at least 12" above roof in frost proof jackets. Size of vents passing through roof shall be as shown on plan with a minimum size being 2". Roof jackets shall not be placed less than 4'-0" from edge of roof. Vent outlets shall be located a minimum of 10’-0”

horizontally from any ventilation opening.

E. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

F. Each building drain shall be provided with at least one full size 3” vent stack or stack vent carried full size through the roof.

G. Installation, support, and bracing of sanitary sewer piping shall comply with the installation procedures described in CISPI 301 and CISPI 310. In no case shall hanger support spacing be a dimension less than as required by code.

3.05 STORM PIPING

A. All gravity drainage storm piping shall be pitched at 1/8" per foot minimum unless indicated otherwise. Piping shall be properly supported so that it will not sag and form pockets.

B. Double wye drainage fittings shall not be installed in the horizontal position.

C. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/8 inch per foot slope.

D. Installation, support, and bracing of storm sewer piping shall comply with the installation procedures described in CISPI 301 and CISPI 310. In no case shall hanger support spacing be a dimension less than as required by code.

3.06 FLASHINGS

A. Install flashings at all cleanouts, roof drains, floor drains, floor sinks, and area drains.

3.07 PIPE SLEEVES

A. Provide sleeves for all piping as follows:
   1. Floor slabs above grade.
   2. Exposed finished areas.
   3. Fire rated or acoustical walls.
   4. Exterior walls.
   5. CMU walls.

B. Sleeves shall be a minimum of 1” greater in inside diameter than piping or insulated piping passing through sleeve.

C. Fabricate all pipe sleeves of new material, cut square and reamed.

D. All sleeves through walls, extend full thickness of wall, cut flush with finished surfaces.

E. Permanent sleeves for copper or cast iron piping through floor slabs for piping, shall extend 2" above finished floor. Sleeves shall extend 4" above the floor in mechanical room, laundry and/or kitchens. All sleeves shall be bonded to the slab with an epoxy bonding material.

F. Pack space between pipe and all sleeves. Packing material shall be as described in

Specification Section 078413.

G. Provide fire stop assembly at the base of the slab at PVC pipe penetrations, pack space between pipe and floor slab with packing material, provide epoxy bonding material at finish floor, provide pipe clamp to support pipe riser.

H. In locating and setting sleeves, this Contractor is to leave a minimum of 4" between sleeves in rows or clusters. Where the normal spacing of top and bottom reinforcing bars cannot be maintained or the bars are interrupted because of sleeves size or cluster location, provide extra reinforcing bar as specified elsewhere around the clusters or sleeves as approved by Architect or Engineer.

3.08 RELIEF PIPING

A. Pipe all relief valve discharge to floor drain.

B. Pipe discharge shall be located to allow safe access to equipment should discharge occur.

3.09 KITCHEN INDIRECT WASTE PIPING

A. Provide indirect waste piping for all kitchen equipment except piping noted on the kitchen equipment drawings as provided by Division 11.

B. Equipment and fixtures used for the storage, preparation, and handling of food or drink shall discharge through indirect waste piping to the sanitary sewer by means of an air gap.

C. Indirect waste piping shall be a minimum of 1" diameter regardless of connection size.

D. Indirect waste piping shall be pitched downward.

E. Provide sufficient cleanouts to allow the entire indirect waste piping system to be cleared of blockages.

3.10 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain chlorine residual of not less than 50 parts per million.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 parts per million, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 0.2 parts per

million.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.12 CLEANING

A. Cleaning
   1. Remove temporary coverings and protection of adjacent work areas.
   2. Repair or replace damaged installed products.

B. Protection
   1. Protect installed work from damage due to subsequent construction activity on the site.

3.13 PLUMBING TESTS

A. The underground water service piping system testing and acceptance procedures shall be performed. The Division 22 is responsible to make all necessary corrections as required if leaks are found during testing. Testing procedures shall be as described below unless otherwise required by Code.

B. Domestic Water: Water piping shall be tested hydrostatically at 125 psig or 1-1/2 times the operating pressure, whichever is greater, for a period of two hours prior to application of pipe insulation and final connection to fixtures.

C. Sanitary and Rainwater Systems - Rough-in: All interior storm, sanitary and vent piping shall be tested with air at 5 psig for a period of not less than 15 minutes. The pressure shall remain constant without the addition of air.

D. Sanitary Systems - Final: Upon installation of fixtures and filling of fixture traps, the roof and building drain openings shall be sealed and the system subjected to a manometer test. The system shall maintain a pressure differential of 1" of water column for a period of not less than 15 minutes. The pressure shall remain constant without the addition of air.

END OF SECTION

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermostatic Mixing Valves.

B. Backflow Preventers.

C. Water Pressure Reducing Valves.

E. Water Temperature and Pressure Relief Valves.

F. Hydrants and Hose Bibbs.

G. Water Filters.

H. Cleanouts.

I. Floor Drains.

J. Roof Drains.

K. Roof Jackets.

L. Drain Flashing.

M. Pool Deck Drains

1.02 RELATED DOCUMENTS

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

B. Section 221005 - Plumbing Piping.

C. Section 224000 - Plumbing Fixtures.

D. Section 223000 - Plumbing Equipment.

1.03 REFERENCES

A. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).

B. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1019).

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Accept specialties on site in original factory packaging. Inspect for damage.

1.06 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

PART 2 PRODUCTS

2.01 THERMOSTATIC HI-LOW MIXING VALVES

A. Thermostatic Mixing Valve
   1. Bronze body.
   2. Mixing valve shall be capable of delivering at least 15 GPM at a temperature between 60 degrees F and 120 degrees F with pressure drop 10 PSI or less.
   3. 3/4” hot and cold inlet, 3/4” tempered outlet.
   4. Field adjustable outlet temperature.
   5. Mixing valve shall be capable of operating down to a flow rate of at least 2 GPM.
   6. Mixing valve shall include thermometer to display mixed water temperature.
   7. Assembly shall comply with ASSE Standard 1017.
   8. Acceptable Manufacturers:
      a. Bradley HL45
      b. Lawler 801
      c. Leonard TM420
      d. Powers SH1432

2.02 ATMOSPHERIC VACUUM BREAKERS

A. Atmospheric vacuum breaker designed to prevent back siphonage of contaminated water into a safe drinking water supply. See Part 3 for approved applications.

B. Manufacturer: Standard type:
   1. Watts No. 288A
   2. Chicago No. 982
   3. Febco 710/715
   4. Wilkins 35.

C. Manufacturer; Flush valve type:
   1. Automatic type as furnished by flush valve manufacturer.

2.03 PRESSURE VACUUM BREAKERS

A. Pressure vacuum breaker designed to prevent back siphonage of contaminated water into a safe drinking water supply. See Part 3 for approved applications.

B. Acceptable Manufacturers:
   1. Watts 800M4QT or 008QT (low spill model)
   2. Febco Model 765.
   3. Wilkins 720A

2.04 DOUBLE CHECK VALVE WITH INTERMEDIATE ATMOSPHERIC VENT

A. Backflow preventer designed for connections to low hazard equipment with continuous line pressure or backpressure. See Part 3 for approved applications.

B. Acceptable Manufacturers:
   1. Watts No. 9D (No. 9BD for post mix beverage machines)
   2. Febco 815.
   3. Wilkins 760

2.05 REDUCED PRESSURE ZONE BACKFLOW PREVENTER

A. Backflow preventer designed for connections to high hazard equipment with continuous line pressure or backpressure. See part 3 for approved applications. Reduced pressure principal style with two independent check valves with intermediate relief valve, shut-off valves and ball type test cocks, and air gap.

B. Acceptable Manufacturers:
   1. Watts No. 909 or 009
   2. Febco 860.
   3. Wilkins 975XL or 375
   4. Conbraco Industries No. 200-T2

2.06 WATER HAMMER ARRESTORS

A. Stainless steel shell, elastomer or stainless steel nested bellows.

B. Arrestor sizing and installation shall conform to Standard PDI-WH201.

C. Size shall be adequate to handle fixtures served, see schedule listed in Part 3.

D. Acceptable Manufacturers:
   1. Josam Series 75000
   2. Wade Shokstop
   3. Zurn Shoktrol
   4. Smith 5000 Series

2.07 WATER PRESSURE REDUCING VALVE

A. Pressure reducing valve body shall be bronze with the entire assembly suitable for potable water service. Seats shall be renewable bronze, nickel alloy or stainless steel. Springs, diaphragm, and disk shall be renewable without requiring valve body to be removed from piping. All welded working parts shall be bronze or stainless steel except for the diaphragm. Valve setting shall be field adjustable. Valve shall be rated for inlet pressure as scheduled.

B. Acceptable Manufacturers:
   1. Watts Model 223
   2. Wilkins 500

2.08 WATER PRESSURE TEMPERATURE RELIEF VALVE

A. Fully automatic temperature and pressure relief.

B. Bronze body non-mechanical seat to disk alignment.

C. ASME Rated, ANSI Z21.22

D. Acceptable Manufacturer:
   1. Watts

2.09 HYDRANTS AND HOSE BIBBS

A. Wall Hydrants – Exterior, Standard Outlet
   1. Non-freeze, automatic draining, loose-key stop, 3/4" threaded outlet.
   2. Integral vacuum breaker.
   3. Manufactured to ASSE standard 1019.
   4. Wall hydrant shall be suitable for wall thickness encountered.
   5. Acceptable Manufacturers:
      a. Wade 8600 – nickel bronze finish
      b. Woodford Model 65 – chrome finish
      c. Josam 71050 – nickel bronze finish
      d. Zurn Z-1310 – stainless steel finish
      e. Smith 5609 QT – chrome finish

B. Hose Bibb - Interior, Flush Mount, Recessed Box (for swimming pool area)

1. Vacuum breaker, vacuum breaker - backflow protected, loose-key stop, threaded hose outlet in a flush mounting nickel bronze wall box.
2. Manufacturers: Josam 71020 or appoved equal.

2.10 CLEANOUTS

A. Finished Floors:
   1. Coated cast iron body, internal gasketed ABS plug, adjustable top assembly with secured scoriated satin Nikaloy round cover. Furnish recessed cover for vinyl tile floor and square top for quarry or ceramic tile floor. Carpeted floors shall use carpet markers.
   2. Acceptable Manufacturers:
      a. Wade W-7000
      b. Josam 56000 Series
      c. Zurn Z-1400
      d. Smith 4020 and 4140 Round

B. Equipment Rooms and Heavy Traffic Areas
   1. Coated cast iron body, tapered threaded ABS plastic plug and adjustable top assembly with heavy duty cast iron tractor cover.
   2. Acceptable Manufacturers:
      a. Wade W-7000- Z
      b. Josam 56050
      c. Zurn Z-1400- HD
      d. Smith 4240

C. Covers for Walls and Ceilings - Finished Areas
   1. Square access cover with chrome plated top, anchor lugs and coverplate secured with screws.
   2. Acceptable Manufacturers:
      a. Wade W-8480-S
      b. Josam 58640
      c. Zurn Z-1460
      d. Smith 4735.

D. Covers for Walls and Ceilings - Unfinished Areas
   1. Round polished stainless steel access coverplate with countersunk screws.
   2. Acceptable Manufacturers:
      a. Wade 8480-R
      b. Josam 58600
      c. Zurn Z-1469
      d. Smith 4472

2.11 FLOOR DRAINS AND AREA DRAINS - ABOVE GRADE

A. Finished Areas
   1. Body - coated cast iron, bottom caulked or no-hub outlet, drainage flange, weep holes, flashing collar.
   2 Strainer - 6" round, threaded adjustable height, satin nickel finish.
   3. Acceptable Manufacturers:
      a. Wade W-1100-STD6

b. Josam 30000-6A
c. Smith 2005 (or 2010)-A06
d. Zurn Z-415-6B

B. Quarry or Ceramic Tiled Areas
1. Body - coated cast iron, bottom caulked or no-hub outlet, drainage flange, weep holes, flashing collar.
2. Strainer - 6" x 6" square, threaded adjustable height, satin nickel finish
3. Drains noted as funnel drains to also include removable 6"x3"x1" high oval funnel.
4. Acceptable Manufacturers:
a. Wade W-1100-G6
b. Josam 30000-6S
c. Smith 2005 (or 2010)-B06
d. Zurn Z-415-6S

C. Equipment Rooms
1. Body - coated cast iron, bottom caulked or no-hub outlet, drainage flange, weep holes, flashing collar.
2. Strainer - 9" round, medium duty, ductile iron, tractor type grate.
3. Acceptable Manufacturers:
a. Josam 30000-9E
b. Smith 2005 (or 2010)-E
c. Zurn Z-415-9N

2.12 FLOOR DRAINS AND AREA DRAINS - ON GRADE

A. Finished Areas
1. Body - coated cast iron, bottom caulked or no-hub outlet, drainage flange, weep holes, flashing collar, and backwater valve. Omit backwater valve if drain is used as tell-tale drain in a kitchen.
2. Strainer - 6" round, threaded adjustable height, satin nickel finish
3. Acceptable Manufacturers:
a. Wade W-1100-STD6-31
b. Josam 30000-6AJ
c. Smith 2005 (or 2010)-A06-V (or -BFV for ball float)
d. Zurn Z-415-6B-V

B. Quarry or Ceramic Tiled Areas
1. Body - coated cast iron, bottom caulked or no-hub outlet, drainage flange, weep holes, flashing collar, and backwater valve. Omit backwater valve if drain is used as tell-tale drain in a kitchen.
2. Strainer - 6" x 6" square, threaded adjustable height, satin nickel finish
3. Drains noted as funnel drains to also include removable 6"x3"x1" high oval funnel.
4. Acceptable Manufacturers:
a. Wade W-1100-G6-31
b. Josam 30000-6SJ
c. Smith 2005 (or 2010-B06-V (or -BFV for ball float)
d. Zurn Z-415-6S-V

C. Equipment Rooms and Unfinished Areas

1. Body - coated cast iron, bottom caulked or no-hub outlet, drainage flange, weep holes, flashing collar, and backwater valve.
2. Strainer - 9" round, threaded adjustable height, ductile iron, tractor type grate.
3. Acceptable Manufacturers:
    a. Josam 30000-9EJ
    b. Smith 2005 (or 2010)-E-V (or -BFV)
    c. Zurn Z-415-9N-V

2.13 ROOF DRAINS

A. Conventional Roof Drain
1. Body – lacquer coated cast iron, bottom caulked or no-hub outlet, large sump, roof flange.
2. Dome - polyethylene dome with clamping ring and gravel stop.
3. Provide with under deck clamp and extensions for insulation encountered.
4. Assembly ASME A112.6.4.
5. Accessories: Coordinate with roofing type.
    a. Membrane flange and membrane clamp with integral gravel stop.
    b. Adjustable under deck clamp.
    c. Roof sump receiver.
    d. Waterproofing flange.
    e. Leveling frame.
    f. Adjustable extension sleeve for roof insulation.
6. Acceptable Manufacturers:
    a. Wade W-3000-DF
    b. Josam Series 21500 or 21000
    c. Smith 1010 or 1015
    d. Zurn Z-100-E

C. Downspout Nozzle
1. Body - cast bronze nozzle, loose wall flange, threaded inlet
2. Finish - rough bronze.
3. Acceptable Manufacturers:
    a. Wade W-3940
    b. Josam 25010
    c. Smith 1770
    d. Zurn Z-199

2.14 ROOF JACKETS

A. Vent stacks for sewer, soil waste and drain lines shall be extended at least 12" above roof and shall be encased in frost proof jackets, Moore, Sure Seal or equal, each having an air space of at least 1" between the outside surface of pipe and inside surface of frost jacket. The top of the frost jackets shall be designed as to permit the insertion therein of a testing plug of such form that it can be readily seen until removed and said plug shall be removed at once after a final inspection has been made and approved by Engineer.

B. Roof jackets shall be constructed of 14 gauge galvanized iron for all sizes 6" and smaller, or factory molded rubber pipe seals with stainless steel clamps as per manufacturer's recommendations, Goodyear or approved equal.

2.15 DRAIN AND CLEANOUT FLASHING

A. Chloraloy polyethylene laminated flashing. Flashing shall be a minimum of 32" x 32".

2.16 LINEAR SLOT POOL DECK DRAINS

A. Linear slop deck drainage system shall NSF Standard 50 approved for pool installations. Construction shall be PVC with removable PVC top caps. Width of top cap shall be approximately 1-3/4” wide.

B. Colors available shall be white, tan, black or grey with final color selection by Architect.

C. System shall be selected and configured to integrate with separate deck drain collector piping system. Provide all necessary joints, fittings, adapters, retaining hardware, etc. to provide complete deck drainage configuration.

D. Acceptable Manufacturer: NDS, Stegmeier, or approved equal.

PART 3 EXECUTION

3.01 VACUUM BREAKERS

A. All vacuum breaker installations shall comply with code requirements.

B. Install vacuum breakers at threaded hose connections, potable water fill connections and where indicated on the drawings. Do not install vacuum breakers on water connections to pressurized systems or systems which could exert back pressure on the vacuum breaker.

C. Vacuum breakers shall be provided integral with each flush valve and tank water closet fill valve.

D. Atmospheric vacuum breakers shall be installed 6” minimum above the spill line of the fixture or equipment served. Shut off valves which create line pressure on both sides of the vacuum breaker are not allowed downstream of an atmospheric vacuum breaker.

E. Pressure vacuum breakers shall be installed 12” minimum above the spill line of the fixture or equipment served. Shut off valves are allowed on the downstream side of a pressure vacuum breaker.

3.02 DOUBLE CHECK VALVE WITH INTERMEDIATE ATMOSPHERIC VENT

A. All installations shall comply with code requirements.

B. Install on where indicated on drawings and on potable water connections to low hazard equipment which may be subject to backpressure making a vacuum breaker unsuitable. Low hazard equipment includes ice machines, coffee machines, and similar food and beverage equipment.

C. Pipe drain and discharge with air gap to nearest floor drain.

3.03 REDUCED PRESSURE ZONE BACKFLOW PREVENTERS

A. All installations shall comply with code requirements.

B. Install on potable water connections to the hot water heating, chilled water, condenser water, or similar pressurized systems where toxic chemicals may be introduced. Install at all additional locations indicated on the drawings.

C. Mount at between 12” and 60” above finished floor.

D. Pipe drain and discharge with air gap to nearest floor drain.

E. Provide isolation valves on the inlet and discharge side of the backflow preventer to allow for servicing.

F. The installing contractor shall notify the owner of the following: The installation of reduced pressure zone backflow preventers is permitted only when periodic testing is done by a trained backflow preventer tester acceptable to the administrative authority. Testing intervals shall not exceed one year, and records must be kept. All devices must be tested after initial installation to assure that debris from the piping installation has not interfered with the functioning of the device. The devices shall be overhauled at least once every five years.

3.04 CLEANOUTS

A. Cleanouts, placed in accessible locations, shall be provided on all storm and sanitary drainage piping where indicated on the drawings, as required by Code, as specified herein, and where necessary to permit rodding of entire drainage system.

B. Cleanouts shall be provided at each change of direction greater than 45 degrees in the building sewer, building drain, horizontal soil, and horizontal waste lines.

C. Cleanouts shall be installed on the building and storm sewer within the building immediately near the building drain and storm sewer exits from the building.

D. Cleanouts shall be provided at the base of each soil or waste stack and at the base of each rainwater leader.

E. Cleanouts shall be placed at 50 foot maximum intervals in horizontal runs for piping 3" or less and 100 foot maximum intervals for piping 4" and over.

F. Cleanouts on piping installed in inaccessible furred spaces, above inaccessible ceiling, or below floor on grade shall be provided with extensions to bring cleanout cover flush with finished wall or floor. Cleanouts in floors with waterproof membrane shall be furnished with flange and suitable clamp device.

G. Cleanouts shall be of the same nominal size as the pipes they serve up to 4” in diameter and not less than 4” in diameter for larger piping.

H. Each horizontal drain branch shall be provided with a cleanout at its upper terminal, except that a fixture with a removable trap or a fixture with an integral trap, readily removable without disturbing concealed piping, may be considered a cleanout equivalent.

I. All floor set fixture drains with concealed traps, such as floor drains and trench drains, that receive fouling waste shall be provided with an integral cleanout or a cleanout shall be installed as close as possible to the drain on the horizontal fixture branch serving the drain. The cleanout shall be the same size as the horizontal fixture branch.

J. A floor drain cleanout may be omitted if the floor drain or fixture branch line is less than 5'-0" in length.

K. A trap opening from a lavatory, drinking fountain, urinal, sink or similar fixture may serve as a cleanout for a horizontal branch drain up to two inches in size, if the drain opening is not more than one pipe size smaller than the horizontal branch drain.

L. A cleanout shall be provided on a common vertical fixture drain or common vent serving two fixture traps that connect to a vertical drain at the same level. The cleanout shall be the same nominal pipe size as the drain serving the fixtures. Where the vertical drain is accessible through the trap opening, the cleanout may be eliminated.

M. Floor drains used for shower drains, recessed slop, or similar receptors may have the full sized cleanout installed on the individual vent pipe serving the fixture or on the fixture.

3.05 FLOOR DRAINS

A. Provide p-trap for all floor drains.

B. Install floor drains without backwater valves on all tell-tale drains in kitchens.

3.06 ROOF DRAINS AND DOWNSPOUT NOZZLES

A. Pipe overflow rain water leaders to downspout nozzle, mount 18" above grade unless shown otherwise. Provide concrete splash block. Coordinate location to discharge clear of sidewalks or pedestrian crossings.

3.07 ROOF JACKETS

A. Vent stacks from sewer, soil, waste and drain lines shall be extended at least 12" above roof in frost proof jackets. Size of vents passing through roof shall be as shown on plan with a minimum size being 2". Roof jackets shall not be placed less than 4'-0" from edge of roof. Vent outlets shall be located a minimum of 10’-0” horizontally from any ventilation opening.

3.08 FLASHINGS

A. Install flashings at all cleanouts, roof drains, floor drains, floor sinks, and area drains.

3.09 HYDRANTS AND HOSE BIBBS

A. Each exterior hydrant shall be provided with a stop and waste valve on the supply to the hydrant.

B. Exterior hydrants shall be installed with the center of the outlet 18" above the adjacent grade unless otherwise detailed or noted on drawings.

C. Interior hose bibbs shall be installed with the center of the outlet 36" above finished floor unless otherwise detailed or noted on drawings.

END OF SECTION

SECTION 22 11 23.13 (15444) - DOMESTIC WATER PACKAGED BOOSTER PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Packaged Domestic Water Booster Pumps

B. Related Sections:

1. Section 03 30 00 (03300) - Cast-in-Place Concrete: for concrete bases.
2. Section 21 10 00 (13900) - Fire Suppression Systems: for fire-suppression pumps.
3. Section 22 05 00 (15050) – Common Work Results for Plumbing
4. Section 22 05 13 (15090) – Common Motor Requirements for Plumbing Equipment: for general motor requirements.
5. Section 22 05 23 (15110) – General Duty Valves for Plumbing Piping
6. Section 22 11 16 (15140) - Domestic Water Piping
7. Section 22 11 23 (15440) - Domestic Water Pumps

1.02 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:

1. B31.9 “Building Services Piping”

B. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
2. B88 “Standard Specification for Seamless Copper Water Tube”
3. B584 “Standard Specification for Copper Alloy Sand Castings for General Applications”

C. Hydraulic Institute (HI) Publications:

1. ANSI/HI 1.1-1.5 “Centrifugal Pumps Nomenclature, Definitions, Applications and Operation”

D. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. ICS 2 “Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 6000 Volts”
2. ICS 6 “Industrial Control and Systems: Enclosures”

E. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

F. Underwriter's Laboratories, Inc. (UL) Standards:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors”
2. 486B “Standard for Wire Connectors for Use With Aluminum Conductors”
3. 508 “Standard for Industrial Control Equipment”

4. 778 “Standard for Motor-Operated Water Pumps”

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Product Data:

a. Include certified performance curves and rated capacities of selected models, furnished specialties, and accessories for each type and size of packaged booster pump indicated.

b. Maintenance Data: For each packaged booster pump to include in maintenance manuals specified in Division 01.

C. Shop Drawings: Show layout and connections for packaged booster pumps. Include setting drawings with templates, directions for installation of foundation and anchor bolts, and other anchorages.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of packaged booster pumps through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's rigging instructions for handling.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. Packaged Domestic Water Booster Pumps:

a. None

B. Approved Manufacturers:

1. Packaged Domestic Water Booster Pumps:

a. Aurora Pump (630-859-7000)

b. Peerless Pump Co. (800-879-0182)

c. SynchroFlo, Inc. (770-447-4443)

2.02 PACKAGED DOMESTIC WATER BOOSTER PUMPS

A. Description: Factory-assembled and -tested, packaged booster pump units; complying with UL 778; suitable for potable-water service. Multiplex packaged unit, with pumps, piping, valves, sensors, hydro-pneumatic tank, and controls for [variable] speed operation.

1. Minimum Pressure Rating: 175 psig.

2. Pump Arrangement: Duplex, with two equal-size pumps.

B. Piping: ASME B31.9 for piping materials and installation.

1. NPS 4 (DN100) and Smaller: ASTM B88, Type L, drawn, copper, water tube with copper, solder-joint, pressure fittings and brazed joints.

2. NPS 5 (DN125) and Larger: ASTM A53, Schedule 40, galvanized-steel pipe with threaded, cast-iron fittings and threaded joints.

3. Header End Connections NPS 2 (DN50) and Smaller: Threaded.

4. Header End Connections NPS 2-1/2 (DN65) and Larger: Flanged.

C. Piping Option: Piping, including valves and other components, may have grooved ends for grooved joints.

D. Shutoff Valves, NPS 2 (DN50) and Smaller: MSS SP-80, Class 125, bronze, rising-stem gate valve or MSS SP-110, 600-psig minimum CWP, bronze ball valve with ends matching piping.

E. Shutoff Valves, NPS 2-1/2 (DN65) and Larger: MSS SP-70, Class 125, bronze-trim, OS&Y, cast-iron gate valve with flanged ends or MSS SP-67, Type I for tight shutoff, 175-psig CWP, single-flanged, cast-iron butterfly valve.

F. Check Valves, NPS 2 (DN50) and Smaller: MSS SP-80, Class 125, bronze, swing check valve.

G. Check Valves, NPS 2-1/2 (DN65) and Larger: MSS SP-71, Class 125, bronze-trim, cast-iron, swing check valve.

H. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and to stop corrosion.

1. NPS 2 (DN50) and Smaller: Factory-fabricated union assembly, for 250-psig minimum working pressure at 180 deg F.

2. NPS 2-1/2 (DN65) and Larger: Factory-fabricated, companion-flange assembly; for 150- or 300-psig minimum working pressure as required to suit system pressures.

I. Sensors: Pressure switches.

J. Control Panel: Automatic, with load control and protection functions. Comply with NEMA ICS 2 and UL 508.

1. Mounting and Wiring: Factory installed and connected as an integral part of unit.

2. Enclosure: NEMA ICS 6, Type 12.

3. Motor Controller: Full-voltage, combination-magnetic type with undervoltage release feature, motor-circuit-protector-type disconnect, and short-circuit protective device.

a. Control Voltage: 120-V ac, using integral control power transformer, primary and secondary fuses.

4. Motor Overload Protection: Overload relay in each phase.

5. Starting Devices: Hand-off-automatic selector switch in cover of control panel, plus pilot device for automatic control.

6. Duplex, Automatic Alternating Starter: Switches lead pump to lag main pump and to two-pump operation.

7. Instrumentation: Unit suction and discharge pressure gages.

8. Alarm Signal Device: Sounds audible alarm when backup pumps are operating, alarm light, manual reset.

9. Instrumentation Panel: Unit suction and discharge pressure gages, failure logic and indicating light, auto reset after alarm condition clears.

K. Finish: Manufacturer's standard paint applied to factory-assembled and -tested units before shipping.

L. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and nozzles.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in of water distribution piping to verify actual locations of connections before packaged booster pump installation.

3.02 CONCRETE

A. Install concrete bases of dimensions indicated for packaged booster pumps. Refer to Section 03 30 00 - "Cast-in-Place Concrete" and Section 22 05 00 - "Common Work Results for Plumbing."

3.03 INSTALLATION

A. Install packaged booster pumps according to manufacturer's written instructions and with access for periodic maintenance, including removing motors, impellers, couplings, and accessories.

1. Install units with total of 7.5 hp or less, with rubber-isolator mount or spring-isolator vibration isolators.

2. Install units with total of more than 7.5 hp, with concrete-filled, inertia-base vibration isolation bases and spring-isolator vibration isolators.

B. Support connected piping so weight of water distribution piping is not supported by packaged booster pumps.

3.04 CONNECTIONS

A. Piping installation requirements are specified in Section 22 11 16 - "Domestic Water Piping." Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Connect water distribution piping to pumps. Install suction and discharge pipe equal to or greater than size of unit suction and discharge headers.

2. Install flexible pipe connectors on piping connections to unit suction and discharge headers. Install flexible pipe connectors same size as piping. Refer to Section 23 05 00 - "Common Work Results for Plumbing " for flexible pipe connectors.

3. Install shutoff valves on piping connections to unit suction and discharge headers. Install valves same size as unit suction and discharge headers. Refer to Section 22 05 23 - "General Duty Valves for Plumbing Piping" for general-duty valves.

B. Install electrical connections for power, controls, and devices.

C. Electrical wiring and connections are specified in Division 26 Sections.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 COMMISSIONING

A. Check suction piping connections for tightness.

B. Controls: Set for automatic starting, stopping, sequential, and alarm operations.

C. Final Checks before Starting: Perform the following preventive maintenance operations:

1. Lubricate bearings.

2. Verify that each pump is free to rotate by hand and that pump for handling hot liquids is free to rotate with pump hot and cold. Do not operate pump if it is bound or drags, until cause of trouble is determined and corrected.

3. Verify that pump controls are correct for required application.

D. Starting procedure for pumps is as follows:

1. Prime pumps by opening suction valves and closing drains, and prepare pumps for operation.

2. Open valves if pumps should not be operated against dead shutoff.

3. Start motors.

4. Open discharge valves slowly.

5. Check general mechanical operation of pumps and motors.

6. Close valves once there is sufficient flow through pumps to prevent overheating.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units as specified below:

1. Conduct training as specified in Division 01 Section".

2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining units.

END OF SECTION

SECTION 22 30 00 (15430) - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Backflow Preventers
2. Water Regulators
3. Clothes Washer Drain & Supply
4. Hydrants
5. Trap Primer Valves
6. Drain Valves
7. Backwater Valves
8. Floor Drains
9. Roof Drains
10. Grease Interceptors
11. Lint Interceptors
12. Miscellaneous Piping Specialties

B. Related Sections:

1. [Section 07 61 00 (07610) - Sheet Metal Roofing]
2. [Section 07 53 23 (07530) - Ethylene-Propylene-Diene-Monomer (EPDM) Roofing]
3. [Section 07 62 00 (07620) - Sheet Metal Flashing and Trim]
4. Section 22 05 00 (15050) – Common Work Results for Plumbing
5. Section 22 05 23 (15110) – General Duty Valves for Plumbing Piping
6. Section 22 05 53 (15075) – Identification for Plumbing Piping and Equipment: for labeling and identifying requirements.
7. Section 22 05 19 (15122) - Meters and Gages for Plumbing Piping
8. Section 22 11 16 (15140) - Domestic Water Piping
9. Section 22 13 16 (15150) - Drainage and Vent Piping
10. Section 22 40 00 (15410) – Plumbing Fixtures and Plumbing Fixture Matrix

1.02 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:

1. A112.1.2 “Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)”
2. A112.14.1 “Backwater Valves”
3. A112.3.1 “Grate Openings”
4. A112.21.1M “Floor Drains”

5. A112.21.2M “Roof Drains”
6. A112.21.3M “Hydrants for Utility and Maintenance Use”
7. B1.20.7 “Hose Coupling Screw Threads, Inch”
8. B31.9 “Building Services Piping”

B. American Society of Sanitary Engineering (ASSE) Publications:

1. 1001 “Performance Requirements for Atmospheric Type Vacuum Breakers”
2. 1003 “Performance Requirements for Water Pressure Reducing Valves”
3. 1010 “Performance Requirements for Water Hammer Arresters”
4. 1011 “Performance Requirements for Hose Connection Vacuum Breakers”
5. 1012 “Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent”
6. 1013 “Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers”
7. 1015 “Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies”
8. 1017 “Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems”
9. 1018 “Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied”
10. 1019 “Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type”
11. 1020 “Performance Requirements for Pressure Vacuum Breaker Assembly”

C. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)

1. A48 "Standard Specification for Gray Iron Castings"
2. A74 “Standard Specification for Cast Iron Soil Pipe and Fittings”
3. B62 “Standard Specification for Composition Bronze or Ounce Metal Castings”
4. C564 “Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings”

D. American Water Works Association (AWWA) Publications:

1. C550 “Standard for Protective Interior Coatings for Valves and Hydrants”

E. Food and Drug Administration (FDA) Publications:

F. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

G. Plumbing & Drainage Institute (PDA) Publications:

1. G101 “Testing and Rating Procedure for Grease Interceptors”
2. WH 201 “Water Hammer Arresters Standard”

H. Underwriter's Laboratories, Inc. (UL) Standards:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors”
2. 486B “Standard for Wire Connectors for Use With Aluminum Conductors”

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:
   a. Backflow preventers.
   b. Water regulators.
   c. Thermostatic mixing valves and water tempering valves.
   d. Water hammer arresters.
   e. Trap primer valves.
   f. Drain valves.
   g. Hydrants.
   h. Clothes washer drain & supply.
   i. Backwater valves.
   j. Cleanouts.
   k. Floor drains, open receptors, and trench drains.
   l. Vent caps, vent terminals, and roof flashing assemblies.
   m. Roof drains.
   n. Lint traps.
2. Reports: Specified in "Field Quality Control" Article.
3. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 01.

1.04 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

B. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

C. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

D. Comply with NFPA 70, "National Electrical Code," for electrical components.

1.05 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described in Section 01 78 43 (01790) - "Spare Parts and materials" below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. Backflow Preventers:
    a. None
2. Water Regulators:
    a. None
3. Thermostatic Water Mixing Valves:
    a. None
4. Clothes Washer Drain & Supply
    a. None
5. Hydrants:
    a. None
6. Water Hammer Arresters:
    a. None
7. Trap Seal Primer Valves:
    a. None
8. Backwater Valves:
    a. None

B. Approved Manufacturers:

1. Backflow Preventers:
    a. Watts Water Technologies, Inc. (978-688-1811)
    b. Zurn Industries, Inc.; Wilkins Div. (805-238-7100)
2. Water Regulators:
    a. Conbraco Industries, Inc. (704-847-9191)
    b. Watts Water Technologies, Inc. (978-688-1811)
    c. Zurn Industries, Inc.; Wilkins Div. (805-238-7100)
3. Thermostatic Water Mixing Valves:
    a. Lawler Manufacturing Co., Inc. (800-763-2709)
    b. Leonard Valve Co. (401-461-1200)
    c. Symmons Industries, Inc. (617-848-2250)
4. Clothes Washer Drain & Supply

a. Acorn Engineering Co. (800-488-8999)

b. Guy Gray Manufacturing Co., Inc., IPS Corporation (800-421-2677)

c. Symmons Industries, Inc. (617-848-2250)

5. Hydrants:

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Woodford Manufacturing Co. (719-574-0600)

c. Zurn Industries, Inc.; Hydromechanics Div. (814-455-0921)

6. Water Hammer Arresters:

a. Precision Plumbing Products, Inc. (503-256-4010)

b. Sioux Chief Manufacturing Co., Inc. (816-779-6104)

c. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

7. Trap Primer Valves:

a. Precision Plumbing Products, Inc. (503-256-4010)

b. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

c. Watts Water Technologies, Inc. (978-688-1811))

d. Zurn Industries, Inc.; Hydromechanics Div. (814-455-0921)

8. Backwater Valves:

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Watts Water Technologies, Inc. (978-688-1811)

c. Zurn Industries, Inc.; Hydromechanics Div.(814-455-0921)

9. Floor Drains

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Josam Co. (800-365-6726)

c. Zurn Industries, Inc. (814-455-0921)

10. Roof Drains

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Josam Co. (800-365-6726)

c. Zurn Industries, Inc. (814-455-0921)

11. Grease Interceptors

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Josam Co. (800-365-6726)

c. Zurn Industries, Inc.; Jonespec Div. (814-455-0921)

12. Oil Interceptors

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Josam Co. (800-365-6726)

c. Zurn Industries, Inc. (814-455-0921)

13. Lint Interceptors

a. Jay R. Smith Mfg. Co., Division of Smith Industries (334-277-8520)

b. Josam Co. (800-365-6726)

c. Zurn Industries, Inc. (814-455-0921)

2.02 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. Body: Bronze, with flanged ends.

2. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.

4. Exterior Finish: Rough Brass.

5. Strainer on inlet.

6. Test Kit with Plastic Case: Per manufacturer's recommendation.

B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

D. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and 2 independent check valves with intermediate atmospheric vent.

E. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves.

1. Pressure Loss: 12 psig maximum, through middle one-third of flow range.

F. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with 2 positive-seating check valves.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

G. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig maximum, through middle one-third of flow range.

2.03 WATER REGULATORS

A. General: ASSE 1003, water regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-pattern strainer.

1. 2-Inch NPS (DN50) and Smaller: Bronze body with threaded ends.
2. 2-1/2-Inch NPS (DN65) and Larger: Bronze or cast-iron body with flanged ends. Include AWWA C550 or FDA-approved interior epoxy coating for regulators with cast-iron body.
3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Standard
5. Single-seated, direct-operated type.

2.04 CLOTHES WASHER DRAIN & SUPPLY

A. General: Recessed-mounting outlet boxes with fittings complying with ASME A112.18.1. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

B. Clothes Washer Outlet Boxes: With hose connections, drain, and the following:

1. Box and Faceplate: Plastic.
2. Shutoff Fittings: 2 hose bibbs.
3. Supply Fittings: Two 1/2-inch NPS (DN15) gate, globe, or ball valves and 1/2-inch NPS (DN15) copper, water tubing.
4. Drain Fitting: 2-inch NPS (DN50) drainage piping P-trap with 2-inch NPS (DN50) standpipe extending from floor to outlet box and 2-inch NPS (DN50) waste.

2.05 HYDRANTS

A. Wall Hydrants: ASME A112.21.3M, nonfreeze, key operation. Provide one operating key.

1. Inlet: 3/4- or 1-inch NPS (DN20 or DN25) threaded or solder joint.
2. Outlet: ASME B1.20.7 garden-hose threads, and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker with ASME B1.20.7 garden-hose threads on outlet.
3. Type: Projecting.
4. Finish: Nickel bronze.

B. Wall Hydrants: ASME A112.21.3M or ASSE 1019, nonfreeze, automatic draining, anti-back flow type, key operation, with 3/4- or 1-inch NPS (DN20 or DN25) threaded or solder-joint inlet, and ASME B1.20.7 garden-hose threads on outlet. Include operating key for each hydrant.

1. Type: Recessed
2. Finish: Nickel bronze.

C. Wall Hydrants: ASME A112.21.3M, projecting, automatic draining, antibackflow type, key operation. Include operating key for each hydrant.

1. Inlet: 3/4- or 1-inch NPS (DN20 or DN25) threaded or solder joint.
2. Outlet: ASME B1.20.7 garden-hose threads.
3. Finish: Nickel bronze.

2.06 TRAP PRIMER VALVES

A. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

1. 125-psig minimum working pressure.

2. Bronze body with atmospheric-vented drain chamber.
3. Inlet and Outlet Connections: 1/2-inch NPS (DN15) threaded, union, or solder joint.
4. Gravity Drain Outlet Connection: 1/2-inch NPS (DN15) threaded or solder joint.
5. Finished: Rough bronze.

2.07 DRAIN VALVES

A. Hose-End Drain Valves: MSS SP-110, 3/4-inch NPS (DN20) ball valve, rated for 400-psig minimum CWP. Include 2-piece, ASTM B62 bronze body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.
   1. Inlet: Threaded or solder joint.
   2. Outlet: Short-threaded nipple with ASME B1.20.7 garden-hose thread and cap.
   3. Hose-End Drain Valve Option: MSS SP-80, gate valve, Class 125, ASTM B62 body, with 3/4-inch NPS (DN20) threaded or solder-joint inlet and ASME B1.20.7 garden-hose threads on outlet and cap. Hose bibbs are prohibited for this application.

B. Stop-and-Waste Drain Valves: MSS SP-110, ball valve, rated for 200-psig minimum CWP or MSS SP-80, Class 125, gate valve; ASTM B62 bronze body, with 1/8-inch NPS (DN6) side drain outlet and cap.

2.08 BACKWATER VALVES

A. Horizontal Backwater Valves: ASME A112.14.1, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.
   1. Closed-Position Check Valve: Factory assembled or field modified to hang closed unless subject to backflow condition.
   2. Open-Position Check Valve: Factory assembled or field modified to hang open unless subject to backflow condition.
   3. Extension: ASTM A74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor, instead of cover.

B. Drain Outlet Backwater Valves: Cast-iron or bronze body, with removable ball float, threaded inlet, and threaded or spigot outlet.

2.09 FLOOR DRAINS

A. Floor Drains:
   1. Comply with ASME A112.21.1M and ASME A112.3.1.
   2. Refer to Plumbing Fixture Matrix

2.10 ROOF DRAINS

A. Roof Drains:
   1. Comply with ASME A112.21.2M and ASME A112.3.1.
   2. Refer to Plumbing Fixture Matrix
   3. Extension Collars: [Required] [Not required].
   4. Underdeck Clamp: [Required] [Not required].
   5. Sump Receiver: Required.

2.11 GREASE INTERCEPTORS:

A. Comply with PDI-G101.

B. Plumbing and Drainage Institute Seal: Required.

C. Body Material: [Cast iron] [Cast iron or steel].

D. Body Extension: [Required] [Not required].

E. Flow Rate: <Insert interceptor design rate>.

F. Grease Retention Capacity: <Insert capacity>.

G. Inlet and Outlet Size: <Insert size>.

H. Cleanout: Integral [or filed installed on outlet].

1. Mounting: [Above floor] [recessed in acid-resistant, coated steel frame and cradle] [Recessed, flush with floor] <Insert other>.

2. Operation: Manual Cleaning.

2.12 LINT INTERCEPTORS

A. Body Material: Cast iron or steel.

B. Flow Rate: <Insert description if required>.

2.13 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units.

B. Interior Hose Bibbs: Bronze body, with renewable composition disc, 1/2- or 3/4-inch NPS (DN15 or DN20) threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.

1. Finish: Rough brass.

2. Operation: Wheel handle.

C. Roof Flashing Assemblies: Coordinate with Division 07 Sections for roofing systems.

D. Open Drains: Shop or field fabricate from ASTM A74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section of length to provide depth indicated; and where indicated, increaser fitting of size indicated, joined with ASTM C564 rubber gaskets. Size P-trap as indicated.

E. Deep-Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.

1. 2-Inch NPS (DN50): 4-inch minimum water seal.

2. 2-1/2 Inch NPS (DN65) and Larger: 5-inch minimum water seal.

F. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

G. Air-Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.

H. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

I. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

J. Vent Terminals: Commercially manufactured, shop-fabricated or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counter flashing, as indicated.

K. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing, of size and end types corresponding to connected piping.

L. Downspout Boots: ASTM A48, gray-iron casting, with 4-inch NPS (DN100) outlet; shop-applied bituminous coating; and inlet size indicated.

M. Downspout Boots: ASTM A74, Service class, hub-and-spigot, cast-iron soil pipe.

PART 3 EXECUTION

3.01 PLUMBING SPECIALTY INSTALLATION

A. General:

1. Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.
2. Install expansion joints on vertical risers, stacks, and conductors as indicated.
3. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
4. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.
5. Secure supplies to supports or substrate.
6. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
7. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.
8. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
9. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

B. Backflow Preventers:

1. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

C. Pressure Regulators:

1. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet. Refer to Section 22 05 19 - “Meters and Gauges for Plumbing Piping”.

D. Hose Bibbs:

1. Install hose bibbs with integral or field-installed vacuum breaker.

E. Wall Hydrants:

1. Install wall hydrants with integral or field-installed vacuum breaker.

F. Valves:

1. Install trap seal primer valves in accessible locations with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow. Identify device locations on record drawings.
2. Install backwater valves in building drain piping as indicated. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
3. Install individual stop valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated.
4. Install water-supply stop valves in accessible locations.

G. Cleanouts:

1. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:
   a. Size same as drainage piping up to 4-inch NPS (DN100). Use 4-inch NPS (DN100) for larger drainage piping unless larger cleanout is indicated.
   b. Locate at each change in direction of piping greater than 45 degrees.
   c. Locate at minimum intervals of 50 feet for piping 4-inch NPS (DN100) and smaller and 100 feet for larger piping.
   d. Locate at base of each vertical soil and waste stack.
2. Install cleanout deck plates, of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.
3. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed walls.

H. Flashings and Vent Caps

1. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
2. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
3. Install frost-proof vent caps on each vent pipe passing through roof (where required). Maintain 1-inch clearance between vent pipe and roof substrate.

I. Floor Drains:

1. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.

b. Radius, 30 to 60 Inches: Equivalent to one percent slope.

c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

4. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

5. Position floor drains for easy access and maintenance.

J. Roof Drains:

1. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Size outlets as indicated.

2. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

3. Position roof drains for easy access and maintenance.

K. Interceptors

1. Install interceptors, including trapping, venting, and flow control fitting, according to authorities having jurisdiction and with clear space for servicing.

a. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.

b. Flush with Floor Installation: Set unit and extension if required, with cover flush with finished floor.

c. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.

d. Install clean out immediately downstream from interceptors not having integral cleanout on outlet.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing specialties and piping specified in other Division 22 Sections.

2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.

3. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.

B. Install hoses between plumbing specialties and appliances as required for connections.

C. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power is specified in Division 26 Sections.

D. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

E. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

F. Interceptor Connections: Connect piping, flow-control fittings, and accessories as indicated.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

G. Ground electric-powered plumbing specialties.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FLASHING INSTALLATION

A. Fabricate flashing manufactured from single piece unless large pans, sumps, or other drainage shapes are required.

B. Burn joints of lead sheets where required.

C. Solder joints of copper sheets where required.

D. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches and skirt or flange extending at least 8 inches around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

E. Set flashing on floors and roofs in solid coating of bituminous cement.

F. Secure flashing into sleeve and specialty clamping ring or device.

G. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Division 07 Sections for type of roofing.

H. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

I. Fabricate and install flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection if indicated.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise the field assembly of components and installation of grease recovery units, including piping and electrical connections, and to report results in writing.

1. Test and adjust plumbing specialty controls and safeties. Replace damaged and malfunctioning controls and components.

3.05 COMMISSIONING

A. Before startup, perform the following checks:

1. System tests are complete.

2. Damaged and defective specialties and accessories have been replaced or repaired.
3. Clear space is provided for servicing specialties.

B. Before operating systems, perform the following steps:
1. Close drain valves, hydrants, and hose bibbs.
2. Open general-duty valves to fully open position.
3. Remove and clean strainers.
4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.

C. Startup Procedures: Follow manufacturer's written instructions.

D. Adjust operation and correct deficiencies discovered during commissioning.

3.06 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and train Owner's maintenance personnel as specified below:
1. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing interceptors.
2. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing grease recovery units.

3.07 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 223413 - DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and assembled, gas-fired, instantaneous, tankless, domestic water heaters, trim and accessories for generating hot potable water.

1.3 SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties and accessories.

B. Pressure Drop Curve: Submit pressure drop curve for flows ranging from 0 GPM to maximum value of water heater.

C. Shop Drawings: For water heaters, water heater trim and accessories, include:

1. Elevations, sections, details

2. Wiring Diagrams for power

D. Operation and Maintenance Data: Data to be included in water heater emergency, operation and maintenance manuals.

E. Warranty: Standard warranty specified in this Section.

F. Made in America Certification

G. Other Informational Submittals.

1. ASME Stamp Certification and Report

1.4 QUALITY ASSURANCE

A. ASME Compliance: Condensing water heaters must be constructed in accordance with ASME Water heater and Pressure Vessel Code, Section IV (HLW) Potable Water Heaters.

B. ETL Compliance. Condensing water heaters must be tested for compliance with ETL, "Commercial-Industrial Gas Heating Equipment." Condensing water heaters shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

C. CO Emission Standards. When installed and operated in accordance with manufacturer’s instructions.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement and formwork requirements are specified in Division 03.

1.6 WARRANTY

A. Standard Warranty: Water heaters shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Condensing Water heaters:

a. The heat exchanger coil shall carry a 10 year from commissioning, non-prorated, limited warranty against any failure due to waterside corrosion, mechanical defects, or workmanship. The heat exchanger coil shall carry a 10 year from shipment, non-prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects, or workmanship.

b. Manufacturer labeled control panels are conditionally warranted against failure for Two (2) years from commissioning

c. All other components, including the electronic igniter and electrode, are conditionally guaranteed against any failure for 24 months from commissioning.

d. Optional extended service for manufacturer to provide factory monitoring of water heater performance and parts via wi-fi or 3G/4G hub. Factory prognostics and predictive maintenance in the optional service

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

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

C. Basis-of-Design Product: Subject to compliance with requirements, provide Intellihot Series IQ, size as shown on drawings; or an approved equal.

2.2 CONSTRUCTION

A. General: Each water heater shall be ETL Listed; ASME Section IV (HLW) coded and stamped and shall incorporate a negative Pressure gas valve on each exchanger capable of full fire operation at of 2.5" WC of Gas pressure. Each unit shall achieve a minimum turn down 8.3 per 250,167 BTU of input. The total water content in the system shall be less than 2 Gallons per 250,167 BTU/hr of input. System shall consist of a Water Model iQ1501, Gen II with an input of 1501 MBH, output of 1380 MBH, 1662 GPH, (27.7 GPM) at 40-140 ^{o}F when fired with natural gas, turndown ratio 50:1, (CO emissions of less than 400 ppm) 250,167 Btu Heat Exchangers

B. Description: Water heater shall be direct fired, fully condensing, water-tube design. Power burner shall have full modulation. The minimum firing rate shall not exceed 30,000 BTU/HR input. Water heaters that have an input greater than 30,000 BTU/Hr at minimum fire will not be considered equal. The water heater shall have the capability of discharging into a positive pressure vent. Water heater thermal efficiency shall increase with decreasing load (output), while maintaining set point. Water heater shall have an operational set point capability of 100 ^{o}F to 190 ^{o}F and shall maintain the outlet temperature within an accuracy of +/- 4 ^{o}F during load changes of up to 30% rated capacity. Water heater shall be factory-fabricated, factory-assembled and factory-tested, water-tube condensing water heater with heat exchanger sealed pressure-tight,

built on a steel base, including a sealed insulated sheet metal enclosure that acts as combustion-air intake plenum with a built in serviceable air filter

C. Heat Exchanger: The heat exchanger shall be constructed with 316L stainless steel helical water tube, fully floating with no welded joints in the exchanger. The exchanger will have a single-pass unitary design (no separate primary and secondary heat exchanger). The water tubes shall be 0.75" ID, with no less than 0.0472" wall thickness. The heat exchanger shall be ASME Sect IV (HLW) stamped for a working pressure not less than 160 psig.

D. Modulating Air/Fuel Valve and Burner: The water heater burner shall be capable of a - 50 to 1 turndown ratio of the firing rate without loss of combustion efficiency or staging of gas valves. The burner shall be stainless fiber mesh covering a stainless steel body with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input. A variable frequency drive (VFD), controlled pre-mix blower shall be used to ensure the optimum mixing of air and fuel between the air/fuel valve and the burner.

E. The exhaust manifold shall be of polypropylene with 6" diameter flue connection.

F. Ignition: Ignition shall be via spark ignition with 100 percent main-valve shutoff and dual electronic flame supervision.

2.3 CONTROLS

A. Refer to Division 23, Section "Instrumentation and Control of HVAC."

B. The water heater control system shall be a Masterless Cascading design with no-master - slave designation. The entire system shall have built-in usage optimization routine.

C. The control panel shall consist of one individual circuit. The circuit boards shall include:

1. A Digital touch display to indicate temperature and status

2. A CPU board housing all control functions

2.4 Each board shall be individually field replaceable.

A. The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.

B. The unit shall have a selectable exhaust temperature limit suitable for venting with PVC or CPVC/Polypropylene/Stainless Steel (AL29-4C).

C. The controls shall annunciate water heater and sensor status and include extensive self-diagnostic capabilities.

1. Set point High Limit: Set point high limit allows for a selectable maximum water heater outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a closed loop function that automatically limits firing rate to maintain outlet temperature.

D. The water heater control system shall incorporate the following additional features for enhanced external system interface:

1. Temperature set point

2. High Exhaust temp monitor and control. Turn down the Gas valve until the exhaust temp is kept below selected material (PVC, CPVC).

3. Cascading via RS232

4. Error Code Display / Error Code History

    a. Blower Fault

    b. Blocked Flue Fault

    c. Ignition Failure

    d. Temp Sensor Short

    e. Temp Sensor Wiring Fault

    f. Flue Temp Fault

    g. Heat Exchanger Temp Fault

    h. Cascading Fault

    i. Water Valve Fault

    j. Pump Fault

    k. Software Fault

5. Monitor and access to daily, weekly, monthly water usages data.

6. Monitor inlet/outlet temperatures, flow rates flue gas temperatures, combustion rates via onboard touchscreen and via IoT app

2.5 Water Heater Management. : the water heater control system shall incorporate onboard multi-unit sequencing logic that would allow Masterless Cascading (Not Lead/Lag) functionality & sequencing between multiple water heaters operating in parallel and must have the following capabilities::

SCHEDULE 1 - Efficiently sequence 2 up to 24 (6,000,000 Btu) heat exchangers on the same system to meet the load requirement.

SCHEDULE 2 - Individual heat exchanger logic to enable accurate temperature control.

SCHEDULE 3 - Operate one motorized valve per heat exchanger as an element of the load sequencing, Valves shall close with decreased load as heaters turn off, minimum of one (depending upon Mode selection) must always stay open for recirculation.

SCHEDULE 4 - Automatically rotate Start/Stop amongst the heat exchangers in the chain based upon an internal calculation of run hours, water through put, burner starts and stops and length of time each burner has been firing. Sequencing is not based upon next in line (Lead/Lag), it is based upon the most logical (least used) heat exchanger in an effort to equalize unit run hours.

SCHEDULE 5 - Automatic bump-less transfer of sequencing in case of heat exchanger failure. All systems must be able to fail all but one heat exchanger in any order or for any reason and the last will continue to operate.

SCHEDULE 6 - Each heat exchanger will default to individual control upon failure of the sequencing chain.

SCHEDULE 7 - Automatic isolation of heat exchanger module from water circuit in case of failure and prevention of cold water from exiting the system

SCHEDULE 8 - Masterless control, change any parameter in any one of the units and all the rest in the series will automatically adjust to the most recent parameter change.

2.6 ELECTRICAL POWER

A. Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 26 sections.

B. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the water heater.

C. Electrical Characteristics:

1. Voltage: 120 V
2. Phase: Single
3. Frequency: 60 Hz
4. Full-Load Current 5 Amps or less per 250,000 BTU of heat input

2.2 CONDENSATE

A. Condensate traps, manufactured from only non-corrosive materials.

B. Optional Accessory: Smart condensate neutralizer with capability of monitoring pH levels through included IoT app. Smart Neutralizer to also include:

1. Monitor water temperatures
2. CO detection, flue gas detection, water leak detection of boiler room w/ audible/visual alarms and alerts via app.
3. Water flow recording/monitoring
4. View history of above parameters via app.

2.3 VENTING

A. The exhaust vent must be PVC, CPVC, Polypropylene, Stainless Steel (AL29-4C) compatible with positive pressure, condensing flue gas service.

B. The minimum exhaust vent duct size for each water heater is six-inch diameter.

C. Combustion-Air Intake: Water heaters shall be capable of drawing combustion air from the outdoors via a metal or PVC duct connected between the water heater and the outdoors.

D. The minimum sealed combustion air duct size for each water heater is 6” diameter.

E. Common Vent and Common Combustion Air up to 4 units. Consult manufacturer for common vent and combustion air sizing.

2.4 SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency.

B. Live-fire Test and inspect factory-assembled water heaters, before shipping.

C. Allow Owner access to source quality-control testing of water heaters.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before water heater installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations. Examine piping and electrical connections to verify actual locations, sizes and other conditions affecting water heater performance, maintenance and operations.

1. Final water heater locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces for suitable conditions where water heaters will be installed.

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

3.2 WATER HEATER INSTALLATION

A. Install water heaters level on concrete bases. Concrete base is specified in Division 23 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 03.

B. Install gas-fired water heaters in accordance with

1. Local, states, provincial and national codes, laws, regulations, and ordinances.
2. National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition.
3. National Electrical Code, ANSI/NFPA 70 - latest edition.
4. Canada only: CAN/CGA B149 Installation Code and CSA C22.1 CEC Part 1.
5. Manufacturer’s installation instructions, including required service clearances and venting guidelines.

C. Assemble and install water heater trim.

D. Install electrical devices furnished with water heater but not specified to be factory mounted.

E. Install control wiring to field-mounted electrical devices.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 sections. Drawings indicate general arrangement of piping, fittings and specialties.

B. Install piping adjacent to water heater to permit service and maintenance.

C. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

D. Connect gas piping to water heater gas valve with unions. Piping shall be at least full size of gas train connection. Provide a reducer if required.

E. Connect hot-water piping to supply and return water heater tappings with shutoff valve and union or flange at each connection.

F. Multiple heaters shall be piped such that all cold water entering the system will go through the heat exchanger first. A series of approved piping installation examples are shown in the installation and maintenance manuals provided with the unit. Each water heater shall have individual isolation valves for servicing and a hot water hose connection for start-up and field testing.

G. Install piping from safety relief valves to nearest floor drain.

H. Water heater Venting

1. Install flue venting kit and combustion-air intake.

2. Connect venting full size to water heater connections. [Comply with requirements in Division 23 Section "Breechings, Chimneys and Stacks."]

I. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

J. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections

1. Installation and Startup Test: Perform installation and startup checks according to manufacturer's written instructions.

2. Leak Test: Perform hydrostatic test. Repair leaks and retest until no leaks exist.

3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion, if necessary.

4. Controls and Safeties: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.

b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

E. Performance Tests: The water heater manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various BTU input levels. If these curves are not available, it is the responsibility of the water heater manufacturer to complete the following performance tests:

1. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.

2. Water heaters shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.

3. Perform field performance tests to determine capacity and efficiency of water heaters.

    a. Test for full capacity.

    b. Test for water heater efficiency at [low fire, 20, 40, 60, 80, 100, 80, 60, 40 and 20] percent of full capacity. Determine efficiency at each test point.

4. Repeat tests until results comply with requirements indicated.

5. Provide analysis equipment required to determine performance.

6. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are not adequate.

7. Notify Architect in advance of test dates.

8. Document test results in a report and submit to Architect.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Plumbing Fixture Standards
2. Miscellaneous Fixture Standards
3. Miscellaneous Component Standards

B. Related Sections:

1. Section 07 92 00 - Joint Sealant: For sealing between fixtures and walls, floors, and counters.
2. Section 22 05 00 – Common Work Results for Plumbing
3. Section 22 30 00 - Plumbing Equipment

1.02 REFERENCES

A. American National Standards Institute (ANSI) Publications:

1. A117.1 “Accessible and Useable Buildings and Facilities”
2. Z124.1 “Plastic Bathtub Units”
3. Z124.1a, and Z124.1b
4. Z124.5 “Plastic Toilet (Water Closet) Seats”
5. Z124.6 “Plastic Sinks”
6. Z358.1 “Emergency Eyewash and Shower Equipment”

B. Air-Conditioning and Refrigeration Institute (ARI) Publications:

1. 1010 “Self-Contained, Mechanically Refrigerated Drinking-Water Coolers”

C. The American Society of Mechanical Engineers (ASME) Publications:

1. A112.6.1.M “Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use”
2. A112.18.1 “Plumbing Fixture Fittings”
3. A112.19.2 “Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals”
4. A112.19.3 “Stainless Steel Fixtures (Designed for Residential Use)”
5. A112.19.4M “Porcelain Enameled Formed Steel Plumbing Fixtures”
6. A112.19.5 “Trim for Water-Closet Bowls, Tanks and Urinals”
7. A112.19.8M “Suction Fittings for Swimming & Wading Pools Spas Hot Tubs & Whirlpool Bathtub Appliances”
8. A112.21.1M “Floor Drains”
9. B1.20.1 "Pipe Threads, General Purpose, Inch"
10. B1.20.7 “Hose Coupling Screw Threads, Inch”

D. American Society of Sanitary Engineering (ASSE) Publications:

1. 1001 “Performance Requirements for Atmospheric Type Vacuum Breakers”
2. 1008 “Performance Requirements for Household Food Waste Disposer Units”
3. 1011 “Performance Requirements for Hose Connection Vacuum Breakers”

4. 1014 “Performance Requirements for Backflow Prevention Devices for Hand-Held Showers”

5. 1016 “Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations”

6. 1025 “Performance Requirements for Diverters for Plumbing Faucets with Hose Spray, Anti-Siphon Type, Residential Applications”

7. 1037 “Performance Requirements for Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures”

E. ASTM International (ASTM) Publications:

1. F444 “Standard Consumer Safety Specification for Scald-Preventing Devices and Systems in Bathing Areas”

2. F445 “Consumer Safety Specification for Thermal-Shock-Preventing Devices and Systems in Showering Areas”

3. F462 “Consumer Safety Specification for Slip-Resistant Bathing Facilities”

F. National Sanitation Foundation Construction (NSF) Publications:

1. 2 “Food Equipment”

2. 61 “Drinking Water System Components - Health Effects”

G. Underwriter's Laboratories, Inc. (UL) Publications:

1. 399 “Drinking Water Coolers”

2. 430 “Waste Disposers”

3. 486A “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors”

4. 486B “Standard for Wire Connectors for Use With Aluminum Conductors”

5. 1795 “Hydromassage Bathtubs”

1.03 DEFINITIONS

A. Accessible: Plumbing fixture, building, facility, or portion thereof that can be approached, entered, and used by physically handicapped, disabled, and elderly people.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, traps and waste pipes. Pipe fittings, tube fittings, and general-duty valves are included where indicated.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product Data for each plumbing fixture category and type specified. Include selected fixture, trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

2. Maintenance data for plumbing fixtures and components to include in the operation and maintenance manuals specified in Division 01.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category from one source and by a single manufacturer.

1. Exception: Where fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for this category.

B. Regulatory Requirements: Comply with requirements of CABO A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; regarding plumbing fixtures for physically handicapped people.

C. Energy Policy Act Requirements: Comply with requirements of Public Law 102-486, "Energy Policy Act," regarding water flush and flow rate and water consumption of plumbing fixtures.

D. Provide Plumbing Fixtures with listed maximum water flush (gpf) and flow rates (gpm). For plumbing fixtures not listed, comply with Comply with requirements of Public Law 102-486, "Energy Policy Act."

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver plumbing fixtures in manufacturer's protective packing, crating, and covering.

B. Store plumbing fixtures on elevated platforms in dry location.

1.07 PROJECT CONDITIONS

A. Field Measurements: Coordinate roughing-in and final fixture locations and verify that plumbing fixtures can be installed to comply with original design and referenced standards.

1.08 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described in Section 01 78 43 - “Spare Parts and Maintenance” that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. **See Plumbing Fixture Matrix for list of which Manufacturer's are approved for use on a specific item.**

B. Approved Manufacturers:

1. American Standard, Inc. (800-442-1902)
    a. Bathtubs
    b. Bathtub Drains
    c. Bath/Shower Diverters, Valves & Trim
    d. Faucets
    e. Vanity Sinks
    f. Laundry Sinks
    g. Service Sinks
    h. Sink Strainers
    i. Toilet Seats
    j. Urinals
    k. Water Closets
2. Church Seats, A Division of Bemis Manufacturing Company (800-233-7328)
    a. Toilet Seats
3. Danze, a brand of Globe Union Branded Products (630-754-0253)

a. Vanity Sinks

b. Water Closets

4. Delta Faucet Company (800-345-3358)

a. Bath/Shower Diverters, Valves & Trim

b. Faucets

c. Mop Hangers/Hose Holders/

d. Sink Strainers

5. Elkay Manufacturing Co. (630-574-8484)

a. Sinks

b. Water Coolers

6. Gerber Plumbing Fixtures, a brand of Globe Union Branded Products (630-754-0253)

a. Bathtub Drains

b. Water Closets

7. Halsey Taylor (630-574-3500)

a. Water Coolers

8. Haws Corp. (510-525-5801)

~~b.~~a. Contact Matt De Shon (303) 803-5690

1) Eye Wash

2) Water Coolers

~~8.~~9. Introsul, Inc. (478-987-3185 x 223)

a. Shower Base

~~9.~~10. Jay R. Smith Mfg. Co. (334-277-8520)

a. Floor Drains

b. Floor Sinks

c. Cleanouts

d. Lint Interceptor

e. Roof Drains

f. Yard Hydrants

g. Wall Hydrants

~~10.~~11. Josam Co. (800-365-6726)

a. Floor Drains

b. Floor Sinks

c. Cleanouts

d. Lint Interceptor

e. Roof Drains

f. Yard Hydrants

g. Wall Hydrants

~~11.~~12. Kohler Co. (800-456-4537)

a. Bathtubs
b. Bathtub Drains
c. Bath/Shower Diverters, Valves & Trim
d. Faucets
e. Laundry Sinks
f. Service Sinks
g. Shower Heads
h. Sinks
i. Sink Strainers/Grid Strainers
j. Toilet Seats
k. Urinals
l. Water Closets

~~12.~~13. McGuire Manufacturing Company, Inc. (203-699-1801)
a. Bathtub Drains

~~13.~~14. Moen Incorporated (800-321-8809)
a. Bath/Shower Diverters, Valves & Trim
b. Faucets
c. Mop Hangers/Hose Holders/
d. Sink Strainers

~~14.~~15. E. L. Mustee & Sons, Inc. (800-321-3128)
a. Mop Sink
b. Mop Hanger/Hose Holder/Wall Guard
c. Laundry Sink / Faucet

~~15.~~16. Oasis Industries Inc. (800-323-2748)
a. Water Coolers

~~16.~~17. Oatey SCS (800-321-9532)
a. Shower Drains

~~17.~~18. Speakman Company (800-537-2107)
a. Shower Heads

~~18.~~19. Sunroc Corp (800-4SUNROC)
a. Water Coolers

~~19.~~20. Symmons Industries, Inc. (800-796-6667)
a. Bath/Shower Diverters, Valves & Trim
b. Faucets

~~20.~~21. Toto USA, Inc. (800-350-8686)
a. Toilet Seats
b. Water Closets

~~21.~~22. Vitra USA

a. Corner Sinks

1) Contact: Pepco Sales and Marketing: Principal: Mike or Charlie Parham, or Dave Dehaes (972-823-8700)

~~22.~~23. Wade Division of Tyler Pipe (800-874-9201)

a. Floor Drains

b. Floor Sinks

c. Cleanouts

d. Lint Interceptor

e. Roof Drains

f. Yard Hydrants

g. Wall Hydrants

~~23.~~24. Provent Systems, Inc. (800-262-5355)

a. Proset Trap Guard Floor Drain Inserts

~~24.~~25. Zurn Industries, Inc. (716-665-1132)

a. Floor Drains

b. Floor Sinks

c. Cleanouts

d. Lint Interceptor

e. Roof Drains

f. Yard Hydrants

g. Wall Hydrants

2.02 PLUMBING FIXTURE STANDARDS

A. Comply with applicable standards below and other requirements specified.

1. Electric Water Coolers: AHRI 1010 and UL 399.
2. Emergency Equipment: ANSI Z358.1.
3. National Sanitation Foundation Construction: NSF 2 and NSF 61.
4. Bathtubs: ANSI Z124.1, ANSI Z124.1a, and ANSI Z124.1b.
5. Plastic Laundry Trays: ANSI Z124.6.
6. Plastic Mop-Service Basins: ANSI Z124.6.
7. Shower Enclosures: ANSI Z124.2 and ANSI Z124.2a.
8. Shower Bases: Cast Polymer ANSI Z124.1.3
9. Porcelain-Enameled Fixtures: ASME A112.19.4M.
10. Slip-Resistant Bathing Surfaces: ASTM F462.
11. Stainless-Steel Fixtures Other than Service Sinks: ASME A112.19.3M.
12. Vitreous-China Fixtures: ASME A112.19.2M.
13. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
14. Water-Closet, Flushometer Tank Trim: ASSE 1037.

2.03 PLUMBING FIXTURE MAXIMUM FLOW RATES

A. The flow rates of plumbing fixtures shall not exceed the maximum values stated below:

Employee / Public Restrooms:

a. Lavatories: 1.00 GPM

b. Water Closets: [1.28] GPF

c. Urinals: [1.00] GPF

Boardroom / Meeting Room / Bar:

d. Sink: 1.50 GPM

Guestrooms:

e. Lavatories: 1.50 GPM

f. Wet Bar: 1.50 GPM

g. Water Closets: [1.28] GPF

h. Showerheads: 2.00 GPM

i. Kitchen Sink: [2.00] GPM

Back-of-House:

j. Employee Breakroom: [2.00] GPM

2.04 LAVATORY/SINK FAUCET STANDARDS

A. Comply with ASME A112.18.1, NSF 61 and other requirements specified for lavatory, sink, and similar-type-fixture faucet fittings. Include hot- and cold-water indicators; 2.5-gpm-maximum flow rate; and finish as shown on Plumbing Fixture Matrix on metal body. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Faucet:

   a. Valve shall be ceramic discs in cartridge assembly.

   b. Handles as indicated.

   c. Pop-up or grid drain as indicated.

2. Diverter Valves for Faucets with Hose Spray: ASSE 1025.

3. Faucet Hose: ASTM D3901.

4. Hose-Connection Vacuum Breakers: ASSE 1011.

5. Hose-Coupling Threads: ASME B1.20.7.

6. Integral, Atmospheric Vacuum Breakers: ASSE 1001.

7. Pipe Threads: ASME B1.20.1.

8. Sink Spray Hoses: ASTM D3573.

9. Accessible Lavatory Trap Insulation Kit: ADA 610.5.

2.05 BATHTUB/SHOWER FAUCET STANDARDS

A. Comply with ASME A112.18.1 and other requirements specified for bathtub and shower faucet fittings. Include hot- and cold-water indicators; 2.5-gpm-maximum flow rate; and finish as shown on Plumbing Fixture Matrix. Coordinate faucet inlets with supplies and outlet with diverter valve; tub spout; and shower head, arm, and flange.

1. All Trim to be metallic.

2. Valving shall be ceramic discs in cartridge assemblies.

3. Cast brass valve-body with integral cast-in service stops.
4. Pressure balancing faucets shall utilize a diaphragm-balancing cartridge with integral check valves.
5. Combination, Pressure-Equalizing- and Thermostatic-Control, Antiscald Faucets: ASSE 1016.
6. Pressure balancing faucets shall utilize a diaphragm-balancing cartridge with integral check valves.
7. Hand-Held Showers: ASSE 1014.
8. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F445.
9. Hose-Coupling Threads: ASME B1.20.1 or ASME B1.20.7.
10. Manual-Control Antiscald Faucets: ASTM F444.
11. Pipe Threads: ASME B1.20.1.
12. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
13. Thermostatic-Control Antiscald Faucets: ASTM F444 and ASSE 1016.

2.06 MISCELLANEOUS FITTING STANDARDS

A. Comply with ASME A112.18.1 and other requirements specified for fittings, other than faucets. Include finish to coordinate with finishes shown on Plumbing Fixture Schedule. Coordinate fittings with other components and connectors.

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Automatic Flow Restrictors: ASSE 1028.
3. Brass and Copper, Supplies and Tubular Brass: ASME A112.18.1M.
4. Fixed Flow Restrictors: ASSE 1034.
5. Manual-Operation Flushometers: ASSE 1037.

2.07 MISCELLANEOUS COMPONENT STANDARDS

A. Comply with applicable standards below and other requirements specified for components for plumbing fixtures, equipment, and appliances.

1. Disposers: ASSE 1008 and UL 430.
2. Floor Drains: ASME A112.21.1M.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Pipe Threads: ASME B1.20.1.
5. Plastic Shower Receptors: ANSI Z124.2 and ANSI Z124.2a.
6. Plastic Toilet Seats: ANSI Z124.5.
7. Supply and Drain Insulation Kits: CABO A117.1.
8. Supports: ASME A112.6.1M.

2.08 FITTINGS

A. Fittings for Plumbing Fixtures: Refer to plumbing fixture schedules in the Appendix for materials for supplies, supply stops, supply risers, traps, and other fittings.

B. Fittings for Equipment Specified in Other Sections: Fittings include the following:

1. Supply Inlets: Brass pipe or copper tube, size required for final connection.
2. Supply Stops: Chrome-plated brass, angle or straight; compression, loose-key type; same size as supply inlet and with outlet matching supply riser.

3. Supply Risers: 3/8-inch NPS (DN10) rigid brass tube with 1/4-inch NPS (DN8) offset, knob-end tailpiece. Use chrome-plated tube for exposed applications.

4. Traps: Tubular brass with 0.045-inch wall thickness, slip-joint inlet, cleanout, wall flange, escutcheons, and size to match equipment. Use chrome-plated tube for exposed applications.

5. Continuous Waste: Tubular brass, 0.045-inch wall thickness, with slip-joint inlet, and size to match equipment.

6. Indirect Waste: Tubular brass, 0.045-inch wall thickness, and size to match equipment.

2.09 FINISHES

A. Refer to Plumbing Fixture Matrix for Finishes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

A. Include supports for plumbing fixtures according to the following:

1. Carriers: For wall-hanging water closets and fixtures supported from wall construction.

2. Chair Carriers: For wall-hanging urinals, lavatories, sinks, drinking fountains, and electric water coolers.

3. Heavy-Duty Chair Carriers: For accessible urinals, lavatories, and other fixtures where indicated.

4. Reinforcement: For floor-mounted lavatories and sinks that require securing to wall and recessed, box-mounted, electric water coolers.

5. Fabricate reinforcement from 2-by-4-inch or 2-by-6-inch fire-retardant-treated-wood blocking between studs or 1/4-by-6-inch steel plates attached to studs, in wall construction, to secure fixtures to wall. Include length that will extend beyond ends of fixture mounting bracket and attach to at least 2 studs.

B. Include fitting insulation kits for accessible fixtures according to the following:

1. Lavatories: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.

2. Sinks: Cover hot- and cold-water supplies, stops and handles, drain, trap, and waste to wall.

3. Fixtures with Offset Drain: Cover hot- and cold-water supplies, offset drain, trap, and waste to wall.

4. Other Fixtures: Cover exposed fittings below fixture.

3.03 PLUMBING FIXTURE INSTALLATION

A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to manufacturers' written instructions, roughing-in drawings, and referenced standards.

C. Install floor-mounted, floor-outlet water closets with closet flanges and gasket seals.

D. Install floor-mounted, back-outlet water closets with fittings and gasket seals.

E. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.

F. Install shower arm elbow fitting secure to backing to prevent movement.

G. Install toilet seats on water closets.

H. Install wall-hanging, back-outlet urinals with gasket seals.

I. 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 handicapped people to reach.

J. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

K. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

L. Fasten floor-mounted fixtures to substrate. Fasten fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

M. Fasten recessed, wall-mounted fittings to reinforcement built into walls.

N. Fasten wall-mounted fittings to reinforcement built into walls.

O. Fasten counter-mounting plumbing fixtures to casework.

P. Secure supplies to supports or substrate within pipe space behind fixture.

Q. Set shower receptors and mop basins in leveling bed of cement grout.

R. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.

1. Exception: Omit stop valves on supplies to emergency equipment, except when permitted by authorities having jurisdiction. When permitted, install valve chained and locked in OPEN position.

S. Install water-supply stop valves in accessible locations.

T. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

U. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

V. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

W. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

X. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.

Y. Install disposers in sink outlets. Install switch where indicated, or in wall adjacent to sink if location is not indicated.

Z. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.

AA. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant according to sealing requirements specified in Section 07 92 00 - "Joint Sealants." Match sealant color to fixture color.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.

B. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules at the end of this Section for fitting sizes and connection requirements for each plumbing fixture.

C. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.

D. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 16 Sections.

3.05 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.

B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.06 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot-water dispensers, and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at drinking fountains, electric water coolers, faucets, shower valves, and flushometer valves having controls, to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.

2. Remove sediment and debris from drains.

3.07 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

3.08 SCHEDULES

A. See Plumbing Fixture Matrix in these specifications

END OF SECTION

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-08								
		NOTE-A	Refer to the "Interior Finish Index" for Wall Tile Specification #344					
		BATHTUB (A)						
		TUB-BTB01A	"Princeton Recess Bath" 60" x 30" x 14"	2391.202.020 (R) or 2390.202.020 (L)	White	American Standard Companies Inc.	Guestroom	Bathroom
		TUB-BTB01K	"Villager Bath" 60" x 30-1/4" x 14"	K-715-0(L) or K-716-0(R)	White	Kohler Company	Guestroom	Bathroom
		TUB-BTB01W	Cayono 60" x 30" x 14"	155/156	White	Kaldewei	Guestroom	Bathroom
		BATH / SHOWER TRIM & VALVE (B)						
		TUB-TRM26K	"HONESTY" Bath / Shower Arm & Flange / Drop-El Wall Connection / Less showerhead Pressure Balance Mixing Valve with Diverter / Less shower head	K-T99762-4-CP K- 20005-CP K-20004-CP K-11748-KS-NA	Chrome (Polished)	Kohler Company	Guestroom	Bathroom
		TUB-TRM22M	"Align Series" Shower Valve Trim Only with red/blue Index / "Posi-Temp" Valve / Shower Arm & Flange / Drop-El Wall Connection / Less showerhead Pressure Balance Mixing Valve with 2 Ports / 3-Way Diverter Valve / Less shower head	62370/T2193NH & A725	Chrome (Polished)	Moen Incorporated	Guestroom	Bathroom
		TUB-TRM18SY	Square valve trim with lever handle / shower arm and flange for Fixed Shower Head w/ red/blue Index w/ Diverter Tub Spout and “Temptrol” Pressure Balanced Mixing Valve / Less showerhead	0142-02-L/HD-SS-TRM & 262XBODY	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Bathroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-08		***BATHTUB DRAIN (C)***						
		TUB-DR01A	Universal Bath Drain	1583.470.002	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Bathroom
		TUB-DR02Mc	"Lift & Turn Bath Waste with Overflow"	1221LAT	Chrome (Polished)	McGuire Mfg. Co., Inc.	Guestroom	Bathroom
		TUB-DR02G	"Lift & Turn Bath Drains"	41-852	Chrome (Polished)	Gerber Plumbing Fixtures, a brand of Globe Union Branded Products	Guestroom	Bathroom
		SHOWER HEADS - WALL MOUNT						
		NOTE-	THERE ARE THREE (3) FLOW RATE CATEGORIES OF SHOWER HEADS LISTED BELOW. SELECT ONLY ONE OF THE CATEGORIES AND DELETE THE CATEGORIES NOT USED FOR THE PROJECT.					
		2.5 GPM SHOWER HEAD - WALL MOUNT (D1)						
		NOTE-	RECOMMENDED GPM FOR OPTIMUM GUEST SATISFACTION AND SHOWERING EXPERIENCE.					
		TUB-SHR10M	"4 Function" Multifunction Shower Head (4-Settings) 2.50 GPM	3638	Chrome (Polished)	Moen Incorporated	Guestroom	Bathroom
		ALTERNATE 2.0 GPM SHOWER HEAD - WALL MOUNT (D2)						
		NOTE-	2.0 GPM FOR USE WHERE REDUCED WATER CONSUMPTION IS DESIRED.					

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-08			***ALTERNATE 2.0 GPM SHOWER HEAD - WALL MOUNT (D2)***					
		TUB-SHR31K	"Awaken G110" (Square Edge) Multifunction Shower Head (3-Settings) 2.00 GPM (WaterSense Certified)	K-72419-CP	Chrome (Polished)	Kohler Company	Guestroom	Bathroom
		TUB-SHR32K	"Awaken B110" (Round Edge) Multifunction Shower Head (3-Settings) 2.00 GPM (WaterSense Certified)	K-72425-CP	Chrome (Polished)	Kohler Company	Guestroom	Bathroom
			ALTERNATE 1.75 GPM SHOWER HEAD - WALL MOUNT (D2)					
		TUB-SHR30M	"6 Function" Multifunction Shower Head (6-Settings) 1.75 GPM (WaterSense Certified)	6512EP	Chrome (Polished)	Moen Incorporated	Guestroom	Bathroom
			ALTERNATE 1.5 GPM SHOWER HEAD - WALL MOUNT (D3)					
		NOTE-	FOR USE ONLY WHERE 1.5 GPM IS REQUIRED DUE TO WATER CONSUMPTION RESTRICTIONS. DOES NOT PROVIDE OPTIMAL SHOWERING EXPERIENCE.					
		TUB-SHR50M	Fixed Mount Shower Head (1-Setting) 1.50 GPM	6399EP15	Chrome (Polished)	Moen Incorporated	Guestroom	Bathroom
		TUB-SHR50SY	"Rain Shower Head" (1-Setting) 1.50 GPM (WaterSense Certified)	4-163-1.5	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Bathroom

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Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-09								
		NOTE-A	Refer to the "Interior Finish Index" for Wall Tile Specification #344					
		BATHTUB (A)						
		TUB-BTB01A	"Princeton Recess Bath" 60" x 30" x 14"	2391.202.020 (R) or 2390.202.020 (L)	White	American Standard Companies Inc.	Guestroom	Accessible Bathroom
		TUB-BTB01K	"Villager Bath" 60" x 30-1/4" x 14"	K-715-0(L) or K-716-0(R)	White	Kohler Company	Guestroom	Accessible Bathroom
		TUB-BTB01W	Cayono 60" x 30" x 14"	155/156	White	Kaldewei	Guestroom	Accessible Bathroom
		BATH / SHOWER TRIM & VALVE (B)						
		TUB-TRM27K	KOHLER "Loure" Shower Arm & Flange / Drop-El Wall Connection / Less showerhead Pressure Balance Mixing Valve with Diverter / Less shower head	K-TS14671-4-CP K- 20005-CP K-20004-CP K-P8304-KS-NA	Chrome (Polished)	Kohler Company	Guestroom	Accessible Bathroom
		TUB-TRM22M	"Align Series" Shower Valve Trim Only with red/blue Index / "Posi-Temp" Valve / Shower Arm & Flange / Drop-El Wall Connection / Less showerhead Pressure Balance Mixing Valve / 3-Way Diverter Valve and Trim / Non-diverter Tub Spout	3360, T2192NH, T4192, A725-3892	Chrome (Polished)	Moen Incorporated	Guestroom	Accessible Bathroom
		TUB-TRM19SY	Square Shower Valve Trim with lever handle with red/blue Index / Non-Diverter Tub Spout / Arm & Flange for Fixed Shower Head & Wall ELL for Handheld / “Temptrol” Pressure Balance Mixing Valve with 2 Ports / 3-Way Diverter Valve / Less shower head	0142-06-L/HDHSB-SS-TRM & 262XBODY & 3DIVBODYSRT	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Accessible Bathroom

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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-09		***BATHTUB DRAIN (C)***						
		TUB-DR01A	Universal Bath Drain	1583.470.002	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Accessible Bathroom
		TUB-DR01Mc	"Pop-up Bath Waste with Overflow"	1221PU	Chrome (Polished)	McGuire Mfg. Co., Inc.	Guestroom	Accessible Bathroom
		TUB-DR01G	"Pop-up Bath Drains"	41-802	Chrome (Polished)	Gerber Plumbing Fixtures, a brand of Globe Union Branded Products	Guestroom	Accessible Bathroom
		SHOWER HEADS - HAND HELD						
		NOTE-	THERE ARE TWO (2) FLOW RATE CATEGORIES OF HAND HELD SHOWER HEADS LISTED BELOW. SELECT ONLY ONE OF THE CATEGORIES AND DELETE THE CATEGORIES NOT USED FOR THE PROJECT.					
		2.0 GPM SHOWER HEAD - HAND HELD (D1)						
		NOTE-	2.0 GPM FOR USE WHERE REDUCED WATER CONSUMPTION IS DESIRED.					
		TUB-SHR33K	"Awaken" G110 with Slidebar / Supply Elbow / 60" metal shower hose. Provide In-Line Vacuum Breaker for Hand held Shower Head (By Trim Manufacturer). (5-Settings) 2.00 GPM (WaterSense Certified)	K-72415-CP K-9514-CP K-98351-CP K-98342-CP	Chrome (Polished)	Kohler Company	Guestroom	Accessible Bathroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-09			***2.0 GPM SHOWER HEAD - HAND HELD (D1)***					
		TUB-SHR34K	"Awaken" B110 with Slidebar / Supply Elbow / 60" metal shower hose. Provide In-Line Vacuum Breaker for Hand held Shower Head (By Trim Manufacturer). (5-Settings) 2.00 GPM (WaterSense Certified)	K-72421-CP K-9514-CP K-98351-CP K-98342-CP	Chrome (Polished)	Kohler Company	Guestroom	Accessible Bathroom
			ALTERNATE 1.75 GPM SHOWER HEAD - HAND HELD (D2)					
		NOTE-	1.75 GPM FOR USE WHERE REDUCED WATER CONSUMPTION IS DESIRED.					
		TUB-SHR40M	Hand Held Shower / Supply Elbow / 60" metal shower hose. Provide In-Line Vacuum Breaker for Hand held Shower Head (By Trim Manufacturer) and volume control valve. (5-Settings) 1.75 GPM (WaterSense Certified)	180238EP/A726/A714/A725 w/ 91888 volume control valve / 3670 EP	Chrome (Polished)	Moen Incorporated	Guestroom	Accessible Bathroom
			BATH / SHOWER DIVERTER (E)					
		TUB-DV06K	Transfer Valve & "Loure" Trim (For Fixed to Handheld Shower Head)	K-T14673-4-CP K-737-K-NA	Chrome (Polished)	Kohler Company	Guestroom	Accessible Bathroom
		TUB-TRM22M	Transfer Valve & Trim (For Fixed to Handheld Shower Head)	Included with BATH / SHOWER TRIM & VALVE (B)	Chrome (Polished)	Moen Incorporated	Guestroom	Accessible Bathroom
		TUB-TRM19SY	Transfer Valve & Trim (For Fixed to Handheld Shower Head)	Included with BATH / SHOWER TRIM & VALVE (B)	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Accessible Bathroom

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Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
TUB-09			***SHOWER HEAD - WALL MOUNT (F)***					
		NOTE-	Refer to Fixed Shower Heads listed under TUB-08		Chrome (Polished)			
SHR-14			***ROLL-IN SHOWER WITH PRE-MANUF. SHOWER BASE***					
		NOTE-A	ADA Roll-In Shower is provided with Handheld Shower Head mtd on Back Wall (long wall) & Fixed Shower Head mtd on End Wall (side wall) with wall mtd diverter to control flow to each. Controls & Diverter located at Hand-Held (Refer to Drawings)					
		NOTE-B	Refer to the "Interior Finish Index" for Wall Tile Specification #344					
		NOTE-C	Refer to Interior Finish Index for Alternate Tile Shower Floor. Revise floor drain for tile as required.					
			SHOWER BASE (A)					
		NOTE-	Refer to Toilet and Bath Accessory Matrix for 62" x 31" Shower Base Mark No. 580				Guestroom	Accessible Roll-In Shower
			SHOWER TRIM & VALVE (B)					
		SHR-TRM17A	Studio S Shower Valve Trim/ Modern Wall Mount Shower Arm/ In-Wall Shower Rough-In Valve	TU105500.002, 1660.241.002, RU101SS	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Accessible Roll-In Shower
		SHR-TRM27K	KOHLER "Loure" Shower Arm & Flange / Drop-El Wall Connection / Less showerhead Pressure Balance Mixing Valve with Diverter / Less shower head	K-TS14671-4-CP K- 20005-CP K-P8304-KS-NA	Chrome (Polished)	Kohler Company	Guestroom	Accessible Roll-In Shower

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Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SHR-14		***SHOWER TRIM & VALVE (B)***						
		SHR-TRM35M	Genta Shower Valve and Trim with Two Function Diverter for Fixed to Hand Held Shower Head	T2470	Chrome (Polished)	Moen Incorporated	Guestroom	Accessible Roll-In Shower
		SHR-TRM20SY	Square Shower Valve and Diverter Trim Only with red/blue Index / Arm & Flange for Fixed Shower Head / Less showerhead / “Temptrol” Pressure Balance Mixing Valve & Diverter Valve / (Use w/ Speakman or Kohler Shower Head Unit below)	0142-05-L/HDHSB-TRM & 262XBODY & 2DIVBODYSRT	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Accessible Roll-In Shower
		BATH / SHOWER DIVERTER (C)						
		SHR-DV04A	Studio S Diverter Trim/Port Rough-in Valve	T105.430.002 & R422	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Accessible Roll-In Shower
		SHR-DV06K	Transfer Valve & "Loure" Trim (For Fixed to Handheld Shower Head)	K-T14673-4-CP K-737-K-NA	Chrome (Polished)	Kohler Company	Guestroom	Accessible Roll-In Shower
		SHR-DV09M	"Posi" Transfer Valve and Diverter	2521 3-FUNCTION BUILT-IN SHOWER VALVE	Chrome (Polished)	Moen Incorporated	Guestroom	Accessible Roll-In Shower
		SHR-TRM20SY	Transfer Valve & Trim (For Fixed to Handheld Shower Head)	Included with SHOWER TRIM & VALVE (B)	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Accessible Roll-In Shower
		SHOWER HEAD - WALL MOUNT (D)						
		NOTE-	Refer to Fixed Shower Heads listed under TUB-08		Chrome (Polished)			

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SHR-14			***SHOWER HEAD - HAND HELD (E)***					
		NOTE-	Refer to Hand Held Shower Heads listed under TUB-09. Provide matching In-Line Vacuum Breaker for Hand held Shower Head.		Chrome (Polished)		Guestroom	Accessible Roll-In Shower
			SHOWER DRAIN (F)					
		SHR-DR03K	Shower Drain for use with Pre-formed shower base and with 2" caulking connection. (Verify connection type)	K-9132-CP	Chrome (Polished)	Kohler Company	Guestroom	Accessible Roll-In Shower
		SHR-DR03O	Shower Drain for use with Pre-formed shower base and with 2" caulking connection. (Verify connection type)	42150	Chrome Plated Strainer	Oatey	Guestroom	Accessible Roll-In Shower
SHR-16			***SHOWER WITH PRE-MANUF. SHOWER BASE***					
		NOTE-A	Refer to Drawings for Location(s) / Refer to Toilet & Bath Accessory Matrix for Glass Shower Door Mark Nos. 452 and 452 (OPT).					
		NOTE-B	Refer to the "Interior Finish Index" for Wall Tile Specification #344					
			SHOWER BASE (A)					
		NOTE-	Refer to Toilet and Bath Accessory Matrix for 72" x 34" Shower Base Mark No. 586				Guestroom	Bathroom
			SHOWER TRIM & VALVE (B)					
		SHR-TRM29K	"Honesty" Shower Valve Trim with lever handle and red/blue Index / Arm & Flange for Fixed Shower Head / “Temptrol” Pressure Balance Mixing Valve / Less showerhead	K-TLS99764-4-CP K-8304-KS-NA	Chrome (Polished)	Kohler Company	Guestroom	Bathroom

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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SHR-16		***SHOWER TRIM & VALVE (B)***						
		SHR-TRM22M	"Align Series" Shower Valve Trim Only with red/blue Index / "Posi-Temp" Valve / Shower Arm & Flange / Drop-El Wall Connection / Less showerhead Pressure Balance Mixing Valve with 2 Ports / Less shower head	62370/T2193NH & A725	Chrome (Polished)	Moen Incorporated	Guestroom	Bathroom
		SHR-TRM21SY	Square Shower Valve Trim with lever handle and red/blue Index / Arm & Flange for Fixed Shower Head / "Temptrol" Pressure Balance Mixing Valve / Less showerhead	0142-01-L/HD-TRM & 262XBODY	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Bathroom
		SHOWER HEAD - WALL MOUNT (C)						
		NOTE-	Refer to Fixed Shower Heads listed under TUB-08		Chrome (Polished)			
		SHOWER DRAIN (D)						
		SHR-DR03K	Shower Drain for use with Pre-formed shower base and with 2" caulking connection. (Verify connection type)	K-9132-CP	Chrome (Polished)	Kohler Company	Guestroom	Bathroom
		SHR-DR03O	Shower Drain for use with Pre-formed shower base and with 2" caulking connection. (Verify connection type)	42150	Chrome (Polished)	Oatey	Guestroom	Bathroom
SNK-03		***SINK (A)***						
		SNK-BWL03A	"Lucerne Wall-Mount Sink" 20-1/2" x 18-1/4" (Basin: 15" x 10" x 6-1/2") / Wall Mount	0355.012.020	White	American Standard Companies Inc.	Back-of-House	Employee Restroom
		SNK-BWL03K	"Chesapeake" 19-1/4" x 17-1/4" (Basin 14" x 11" x 4-7/8") / Wall Mount	K-1728-0	White	Kohler Company	Back-of-House	Employee Restroom

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SNK-03			***FAUCET (B)***					
		SNK-FCT21A	Studio S Collection Widespread Bathroom Faucet 6" Spout	7105.801.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	Employee Restroom
		SNK-FCT27K	Components sink spout with tube design w/ sink handles with lever design 1.20 GPM (WaterSense Certified) 6-5/16" Spout	K-77967 & K-77974-4	Chrome (Polished)	Kohler Company	Back-of-House	Employee Restroom
		SNK-FCT19SY	Design Studio Creations Two Handle Widespread Lavatory Faucet 5" Spout	SLW-0479-12	Chrome (Polished)	Symmons Industries Inc.	Back-of-House	Employee Restroom
			SINK GRID STRAINER (C)					
		SNK-STR01A	Sink Strainer	4331.023.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	Employee Restroom
SNK-04			***SINK (A)***					
		SNK-BWL10A	"Ovalyn Undercounter Sink" Bowl: 17" x 14" x 5-1/2" / Undermount	0495.221.020	White	American Standard Companies Inc.	Public	Restroom
		SNK-BWL01K	"Caxton Undercounter Lavatory" Bowl: 17" x 14" x 4" / Undermount (Granite)	K-2210-0	White	Kohler Company	Public	Restroom
			FAUCET (B)					
		SNK-FCT27K	Components sink spout with tube design w/ sink handles with lever design 1.20 GPM (WaterSense Certified) 6-5/16" Spout	K-77967 & K-77974-4	Chrome (Polished)	Kohler Company	Public	Restroom
		SNK-FCT21A	Studio S Collection Widespread Bathroom Faucet 6" Spout	7105.801.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SNK-04			***FAUCET (B)***					
		SNK-FCT19SY	Design Studio Creations Two Handle Widespread Lavatory Faucet 5" Spout	SLW-0479-12	Chrome (Polished)	Symmons Industries Inc.	Public	Restroom
			SINK GRID STRAINER (C)					
		SNK-STR01A	Sink Strainer	4331.023.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
SNK-05			***SINK (A)***					
		SNK-BSN05E	"Celebrity Single Bowl" 15" x 15" (Basin: 12" x 10" x 6") / Top Mount (Laminate)	BCR153	Stainless Steel	Elkay Manufacturing Co.	Employee	Breakroom
		SNK-BSN05K	"Sterling Single Basin Entertainment Sink" 15" x 15" x 5-1/2" (Basin: 13-1/4" x 11" x 5-1/2") / Top Mount (Laminate)	B155-2	Stainless Steel	Kohler / Sterling Company	Employee	Breakroom
			FAUCET (B)					
		SNK-FCT05K	"Coralais" Single Control Faucet with Sidespray and Lever Handle / red/blue Index 2.20 GPM 10" Swing Spout	K-15176-FL-CP	Chrome (Polished)	Kohler Company	Employee	Breakroom
		SNK-FCT05M	"Chateau" Single-Handle Kitchen Faucet with Side Spray with red/blue index 2.20 GPM 9-1/8" Spout / 4" Centers	7430	Chrome (Polished)	Moen Incorporated	Employee	Breakroom
SNK-06			***SINK (A)***					
		SNK-BSN06E	"Lustertone Undermount Single Bowl Sink" Bowl: 13-1/4" x 13-1/4" x 5-15/16" / Undermount (Granite)	ELU1113	Stainless Steel	Elkay Manufacturing Co.	Public	Boardroom

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SNK-06		***SINK (A)***						
		SNK-BSN06K	"Undertone Undercounter Sink" Bowl: 13-3/4" x 15-3/8" x 7-1/2" / Undermount (Granite)	K-3336-NA	Stainless Steel	Kohler Company	Public	Boardroom
		FAUCET (B)						
		SNK-FCT06A	"Colony Soft Two-Handle Centerset Bar Sink Faucet" / red/blue Index 5" Gooseneck Spout	2475.500RB.295	Satin Chrome	American Standard Companies Inc.	Public	Boardroom
		SNK-FCT07K	"Coralais" with Red/Blue Index 2.20 GPM 4" Gooseneck Spout / 4" Centers	K-15275-4-CP	Chrome (Polished)	Kohler Company	Public	Boardroom
		SNK-FCT06M	Two-Handle Bar Faucet with red/blue index 2.00 GPM 10-1/2" Gooseneck Spout / 4" Centers	4903	Chrome (Polished)	Moen Incorporated	Public	Boardroom
		SINK GRID STRAINER (C)						
		SNK-STR01A	Sink Strainer	4331.013.002	Chrome (Polished)	American Standard Companies Inc.	Public	Boardroom
		SNK-STR04K	Grid Strainer	K-9115-CP	Chrome (Polished)	Kohler Company	Public	Boardroom
		SNK-STR01M	Grid Strainer	14750	Chrome (Polished)	Moen Incorporated	Public	Boardroom
SNK-29		***SINK (A)***						
		SNK-BSN06A	Steel Kitchen Sink Bowl: 15" x 17" x 9" / Undermount (Granite)	14SB.191700.073	Stainless Steel	American Standard Companies Inc.	Guestroom	Wet Bar

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Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SNK-29		***SINK (A)***						
		SNK-BSN06E	"Lustertone Undermount Single Bowl Sink" Bowl: 13-1/4" x 13-1/4" x 5-15/16" / Undermount (Granite)	ELU1113	Stainless Steel	Elkay Manufacturing Co.	Guestroom	Wet Bar
		SNK-BSN06K	"Undertone Undercounter Sink" Bowl: 13-3/4" x 15-3/8" x 7-1/2" / Undermount (Granite)	K-3336-NA	Stainless Steel	Kohler Company	Guestroom	Wet Bar
		FAUCET (B)						
		SNK-FCT18M	"Align" Series Single Handle Single Hole Mount Hi Arc Bar Sink Faucet with red/blue index 1.50 GPM 6 3/4" Spout / Single Hole Mount	7365 Series	Chrome (Polished)	Moen Incorporated	Guestroom	Wet Bar
		SNK-FCT18SY	"Dia Bar Sink Faucet" / red/blue Index 1.50 GPM 11" H Gooseneck Spout	SPB-3510-1.5	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Wet Bar
		SINK GRID STRAINER (C)						
		SNK-STR01A	Sink Strainer	4331.013.002	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Wet Bar
		SNK-STR04K	Sink Strainer	7466-NA	Stainless Steel	Kohler / Sterling Company	Guestroom	Wet Bar
		SNK-STR01M	Grid Strainer	14750	Chrome (Polished)	Moen Incorporated	Back-of-House	Laundry
SNK-41		***SINK (A)***						
		SNK-BWL11A	Radcliffe Undermount Sink 18-1/2"L x 12-5/8" W x 5-7/8"D / Undermount	1997100	White	American Standard Companies Inc.	Guestroom	Bathroom

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SNK-41			***SINK (A)***					
		SNK-BWL14K	"Caxton" 17-5/8"L x 13-1/8"W x 5-5/16"D / Undermount	K-20000	White	Kohler Company	Guestroom	Bathroom
			FAUCET (B)					
		SNK-FCT21A	Studio S Collection Widespread Bathroom Faucet 6" Spout	7105.801.002	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Bathroom
		SNK-FCT27K	Components sink spout with tube design w/ sink handles with lever design 1.20 GPM (WaterSense Certified) 6-5/16" Spout	K-77967 & K-77974-4	Chrome (Polished)	Kohler Company	Guestroom	Bathroom
		SNK-FCT19SY	Design Studio Creations Two Handle Widespread Lavatory Faucet 5" Spout	SLW-0479-12	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Bathroom
SNK-42			***SINK (A)***					
		SNK-BWL11A	Radcliffe Undermount Sink 18-1/2"L x 12-5/8" W x 5-7/8"D / Undermount	1997100	White	American Standard Companies Inc.	Guestroom	Bathroom / Accessible Bathroom
		SNK-BWL14K	"Caxton" 17-5/8"L x 13-1/8"W x 5-5/16"D / Undermount	K-20000	White	Kohler Company	Guestroom	Bathroom / Accessible Bathroom
			FAUCET (B)					
		SNK-FCT21A	Studio S Collection Widespread Bathroom Faucet 6" Spout	7105.801.002	Chrome (Polished)	American Standard Companies Inc.	Guestroom	Bathroom / Accessible Bathroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SNK-42			***FAUCET (B)***					
		SNK-FCT27K	Components sink spout with tube design w/ sink handles with lever design 1.20 GPM (WaterSense Certified) 6-5/16" Spout	K-77967 & K-77974-4	Chrome (Polished)	Kohler Company	Guestroom	Bathroom / Accessible Bathroom
		SNK-FCT19SY	Design Studio Creations Two Handle Widespread Lavatory Faucet 5" Spout	SLW-0479-12	Chrome (Polished)	Symmons Industries Inc.	Guestroom	Bathroom / Accessible Bathroom
SVS-01			***SERVICE SINK (A)***					
		SVS-SVR01A	"Lakewell Cast Iron Service Sink" 22" x 18" (Basin: 18-1/2" x 14-1/8" x 10-1/2") / Wall Hung	7692.008.020	White	American Standard Companies Inc.	Back-of-House	(As Required - Option for Mop Sink MOP-01)
		SVS-SVR01K	"Bannon" Cast Iron 22-1/4" x 18-1/4" (Basin: 18" x 14" x 12") / Wall Hung	K-6714-0	White	Kohler Company	Back-of-House	(As Required - Option for Mop Sink MOP-01)
			FAUCET (B)					
		SVS-FCT09A	"Exposed Yoke" wall-mount - threaded spout for hose connection, lever handles and pail hook 6-1/2" Wall-to-spout outlet / 8" Centers	8350.235.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	(As Required - Option for Mop Sink MOP-01)
		SVS-FCT09K	"Knoxford" - threaded spout for hose connection, lever handles and pail hook 4-5/8" Wall-to-spout outlet / 8" Centers	K-8928-CP	Chrome (Polished)	Kohler Company	Back-of-House	(As Required - Option for Mop Sink MOP-01)
		SVS-FCT10M	Two-Handle Laundry Faucet 6-5/8" High Rise Swing Spout / 4" Centers	74998	Chrome (Polished)	Moen Incorporated	Back-of-House	(As Required - Option for Mop Sink MOP-01)

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SVS-01		***SINK STRAINER (C)***						
		SVS-STR01A	Sink Strainer	4331.013.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	(As Required - Option for Mop Sink MOP-01)
		SVS-STR01K	"Duostrainer"	K-6672-NA (2") or K-6673-NA (3")	Chrome (Polished)	Kohler Company	Back-of-House	(As Required - Option for Mop Sink MOP-01)
SVS-02		***LAUNDRY SINK (A)***						
		SVS-BWL08MS	Double Compartment - One-Piece Molded construction with complete drain assembly, twin drain waste coupling, 4 legs, levelers and stopper. 40"W x 24"D x 34"H (Basin: 14-3/8"D) / Floor Mounted	27F x 18.300F	White	E.L. Mustee & Sons	Back-of-House	Laundry
		SVS-BWL08F	"Molded-Stone Floor Mouonted Serv-A-Sink" Twin Compartment - One-Piece Molded construction with complete drain assembly, twin drain waste coupling, 4 legs, levelers and stopper. 40"W x 24"D x 33-3/4"H (Basin: 12-1/2"D) / Floor Mounted	FLTD II	White	Fiat Products, A Crane Plumbing Company	Back-of-House	Laundry
		FAUCET (B)						
		SVS-FCT10MS	Faucet - Laundry Tub 6" High Rise Swing Spout / 4" Centers	93.600	Chrome (Polished)	E.L. Mustee & Sons	Back-of-House	Laundry
		SVS-FCT11K	Faucet - "Coralais" Laundry Tub 2.20 GPM 6" High Rise Swing Spout / 4" Centers	K-15271-4-CP	Chrome (Polished)	Kohler Company	Back-of-House	Laundry
		SVS-FCT10F	Faucet - Two-Handle Deck Faucet 6-1/4" Swing Spout / 4" Centers	A-1	Chrome (Polished)	Fiat Products, A Crane Plumbing Company	Back-of-House	Laundry

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Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SVS-02			***FAUCET (B)***					
		SVS-FCT10M	Two-Handle Laundry Faucet 6-5/8" High Rise Swing Spout / 4" Centers	74998	Chrome (Polished)	Moen Incorporated	Back-of-House	Laundry
SVS-03			***LAUNDRY SINK (A)***					
		SVS-SVR02A	Scrub Sink with Wall Brackets (Optional for use when space is limited) 28" x 22" / Wall Mounted	047.044.020 & 485742.600	White	American Standard Companies Inc.	Back-of-House	Laundry
		SVS-SVR02K	"Hollister" Single Compartment Sink with Wall Brackets (Optional for use when space is limited) 28" x 22" (Basin 26" x 16" x 11-1/8") / Wall Mounted	K-12793-0 & K-1814-P	White	Kohler Company	Back-of-House	Laundry
			FAUCET (B)					
		SVS-FCT10A	Lavatory Gooseneck Spout 11-7/8" Gooseneck Spout	7522.155.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	Laundry
		SVS-FCT10K	Lavatory Gooseneck Spout 5" Gooseneck Spout	K-13770-CP	Chrome (Polished)	Kohler Company	Back-of-House	Laundry
			KNEE CONTROL (C)					
		SVS-KNC01A	Self-Closing Double Knee-Action Valve	7676.129.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	Laundry
		SVS-KNC01K	Knee Control Fitting	K-13816--CP	Chrome (Polished)	Kohler Company	Back-of-House	Laundry
			GRID STRAINER (D)					
		SVS-STR04A	Grid Strainer	4311.023.002	Chrome (Polished)	American Standard Companies Inc.	Back-of-House	Laundry

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
SVS-03		***GRID STRAINER (D)***						
		SVS-STR03K	Grid Strainer	K-9115	Chrome (Polished)	Kohler Company	Back-of-House	Laundry
WCL-05		***WATER CLOSET (A1)***						
		WCL-WCL05A	"Madera Elongated Flush Valve Toilet" 1.10 to 1.60 GPF 28-1/4" x 14" x 15" / Floor Mounted 10" or 12" Rough (See Toilet Seat Note 4 Below)	2234.001.020	White	American Standard Companies Inc.	Public	Restroom
		WCL-WCL05K	Wellcomme Ultra Bowl (1.28 gpf / 1.60 gpf) 26-3/8" L x 14-7/8" W x 15-1/4" H / Floor Mounted (See Toilet Seat Note 4 Below)	K-96053-0	White	Kohler Company	Public	Restroom
		WCL-WCL05T	"Flushometer Toilet" 1.60 GPF 25-1/4" x 14-3/8" x 15" / Floor Mounted (See Toilet Seat Note 4 Below)	CT705	White	Toto USA, Inc.	Public	Restroom
		WCL-WCL04G	"Commercial Elongated Top Spud Bowl" 1.60 GPF (WaterSense Certified) 27-1/2" x 14-1/2" x 14-3/4" (14-3/4" H Rim Height) / Floor Mounted 10" Rough (See Toilet Seat Note 4 Below)	25-830	White	Gerber Plumbing Fixtures, a brand of Globe Union Branded Products	Public	Restroom
		WATER CLOSET (A2) - ALTERNATE FOR WATER CONSERVATION						
		WCL-WCL05K	Wellcomme Ultra Bowl (1.28 gpf / 1.60 gpf) 26-3/8" L x 14-7/8" W x 15-1/4" H / Floor Mounted (See Toilet Seat Note 4 Below)	K-96053-0	White	Kohler Company	Public	Restroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-05			***TOILET SEAT (B)***					
		WCL-TS03CH	Elongated Seat, Open Front w/ No Cover. "Just-Lift" Integrated Hinge system. "Sta-Tite" Fastening System / (See Toilet Seat Note 4 Below)	2155CTJ	White	Church Seats, A Division of Bemis Manufacturing Company	Public	Restroom
		WCL-TS02A	Open Front w/ No Cover	5901.100.020	White	American Standard Companies Inc.	Public	Restroom
		WCL-TS02K	"Stronghold" Open Front w/ No Cover	K-4731-C-0	White	Kohler Company	Public	Restroom
		WCL-TS01T	Open Front w/ No Cover	SC534	White	Toto USA, Inc.	Public	Restroom
			FLUSH VALVE (C1)					
		WCL-FLV01A	Exposed Flush Valve - Manual Operation ADA Compliant 1.60 GPF / Wall Mounted	6047.161.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		WCL-FLV01K	Exposed Flush Valve - Manual Operation ADA Compliant 1.60 GPF / Wall Mounted	K-13516-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		WCL-FLV01M	Exposed Flush Valve - Manual Operation ADA Compliant 1.60 GPF / Wall Mounted	8310M16	Chrome (Polished)	Moen Incorporated	Public	Restroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-05			***FLUSH VALVE (C2) - UPGRADE OPTION***					
		WCL-FLV03A	Selectronic Sensor Operated, Concealed Flush Valve ADA Compliant 1.60 GPF / Wall Mounted	6065.161.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		WCL-FLV03K	"Exposed Flush Valve" Touchless "Wave" Technology 1.60 GPF / Wall Mounted	K-10674-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		WCL-FLV03M	M-Power Sensor Operated Concealed Flush Valve ADA Compliant 1.60 GPF / Wall Mounted	8310	Chrome (Polished)	Moen Incorporated	Public	Restroom
			FLUSH VALVE (C3) - ALTERNATE FOR WATER CONSERVATION TO BE USED WITH 1.28 GPF WATER CLOSET					
		WCL-FLV07A	Selectronic Sensor Operated, Concealed Flush Valve ADA Compliant 1.28 GPF / Wall Mounted	6065.121.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		WCL-FLV07K	"Exposed Flush Valve" Touchless "Wave" Technology 1.28 GPF / Wall Mounted	K-10673-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom

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Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-05			***FLUSH VALVE (C3) - ALTERNATE FOR WATER CONSERVATION TO BE USED WITH 1.28 GPF WATER CLOSET***					
		WCL-FLV07M	M-Power Sensor Operated, Concealed Flush Valve ADA Compliant with manual override 1.28 GPF / Wall Mounted	8311	Chrome (Polished)	Moen Incorporated	Public	Restroom
WCL-06			***WATER CLOSET (ADA) (A1)***					
		WCL-WCL06A	"Madera ADA Elongated Flush Valve Toilet" 1.10 to 1.60 GPF 28-1/4" x 14" x 16-1/2" / Floor Mounted 10" Rough (See Toilet Seat Note 4 Below)	3043.001.020	White	American Standard Companies Inc.	Public	Restroom
		WCL-WCL06K	Highcliff Ultra Bowl (1.28 gpf / 1.60 gpf) 26-3/8" L x 14-5/8" W x 16-7/8" H / Floor Mounted (See Toilet Seat Note 4 Below)	K-96057-0	White	Kohler Company	Public	Restroom
		WCL-WCL06T	"Flushometer Toilet" 1.60 GPF 25-1/4" x 14-3/8" x 17-1/2" / Floor Mounted (See Toilet Seat Note 4 Below)	CT705L	White	Toto USA, Inc.	Public	Restroom
		WCL-WCL05G	"ADA Compliant Elongated Top Spud Bowl" 1.60 GPF (WaterSense Certified) 27" x 14-1/2" x 17" (17" H Rim Height) / Floor Mounted 10" Rough (See Toilet Seat Note 4 Below)	25-730	White	Gerber Plumbing Fixtures, a brand of Globe Union Branded Products	Public	Restroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-06			***WATER CLOSET (ADA) (A2) - ALTERNATE FOR WATER CONSERVATION***					
		WCL-WCL06K	Highcliff Ultra Bowl (1.28 gpf / 1.60 gpf) 26-3/8" L x 14-5/8" W x 16-7/8" H / Floor mounted	K-96057-0	White	Kohler Company	Public	Restroom
			TOILET SEAT (B)					
		WCL-TS03CH	Elongated Seat, Open Front w/ No Cover. "Just-Lift" Integrated Hinge system. "Sta-Tite" Fastening System. - See Note 4	2155CTJ	White	Church Seats, A Division of Bemis Manufacturing Company	Public	Restroom
		WCL-TS02A	Open Front w/ No Cover	5901.100.020	White	American Standard Companies Inc.	Public	Restroom
		WCL-TS02K	"Stronghold" Open Front w/ No Cover	K-4731-C-0	White	Kohler Company	Public	Restroom
		WCL-TS01T	Open Front w/ No Cover	SC534	White	Toto USA, Inc.	Public	Restroom
			FLUSH VALVE (C1)					
		WCL-FLV01A	Exposed Flush Valve - Manual Operation ADA Compliant 1.60 GPF / Wall Mounted	6047.161.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		WCL-FLV01K	Exposed Flush Valve - Manual Operation ADA Compliant 1.60 GPF / Wall Mounted	K-13516-CP	Chrome (Polished)	Kohler Company	Public	Restroom

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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-06			***FLUSH VALVE (C1)***					
		WCL-FLV01M	Exposed Flush Valve - Manual Operation ADA Compliant 1.60 GPF / Wall Mounted	8310M16	Chrome (Polished)	Moen Incorporated	Public	Restroom
			FLUSH VALVE (C2) - UPGRADE OPTION					
		WCL-FLV03A	Selectronic Sensor Operated, Concealed Flush Valve ADA Compliant 1.60 GPF / Wall Mounted	6065.161.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		WCL-FLV03K	Selectronic Sensor Operated, Concealed Flush Valve ADA Compliant 1.60 GPF / Wall Mounted	K-10674-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		WCL-FLV03M	M-Power Sensor Operated Concealed Flush Valve ADA Compliant 1.60 GPF / Wall Mounted	8310	Chrome (Polished)	Moen Incorporated	Public	Restroom
			FLUSH VALVE (C3) - ALTERNATE FOR WATER CONSERVATION TO BE USED WITH 1.28 GPF WATER CLOSET					
		WCL-FLV07A	Selectronic Sensor Operated, Concealed Flush Valve ADA Compliant 1.28 GPF / Wall Mounted	6065.121.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-06			***FLUSH VALVE (C3) - ALTERNATE FOR WATER CONSERVATION TO BE USED WITH 1.28 GPF WATER CLOSET***					
		WCL-FLV07K	"Exposed Flush Valve" Touchless "Wave" Technology 1.28 GPF / Wall Mounted	K-10673-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		WCL-FLV07M	M-Power Sensor Operated, Concealed Flush Valve ADA Compliant with manual override 1.28 GPF / Wall Mounted	8311	Chrome (Polished)	Moen Incorporated	Public	Restroom
WCL-16			***WATER CLOSET (A)***					
		WCL-WCL07A	Concealed Trapway Cadet 3 FloWise Right Height Elongated Floor Mounted Toilet - Duraplast Slow-Close toilet seat included 1.28 GPF 15-3/4" x 30-1/4" x 30-1/4" (16-1/2" Rim Height) / Floor Mounted	2989101.020	White	American Standard Companies Inc.	Guestroom	Bathroom
		WCL-WCL13G	"Wicker Park 1 Piece Elongated Ergo Height Toilet" Soft Close - Toilet Seat Included 1.28 GPF 29-5/8"H x 14-1/2"W x 28-3/4"D (16-1/2" Rim Height) / Floor Mounted	21-221	White	Gerber Plumbing Fixtures, a brand of Globe Union Branded Products	Guestroom	Bathroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCL-16		***WATER CLOSET (A)***						
		WCL-WCL13K	"Reach Comfort Height 1 pc Elongated Toilet" Quiet Close - K-4008 Toilet Seat Included 1.28 GPF 28.7" x 14.3" x 29" (16.5" H Rim Height) / Floor Mounted	K-78080-0	White	Kohler Company	Guestroom	Bathroom
		WCL-WCL07A	Concealed Trapway Cadet 3 FloWise Right Height Elongated Floor Mounted Toilet - Duraplast Slow-Close toilet seat included 1.28 GPF 15-3/4" x 30-1/4" x 30-1/4" (16-1/2" Rim Height) / Floor Mounted	2989101.020	White	American Standard Companies Inc.	Guestroom	Accessible Bathroom
		WCL-WCL13G	"Wicker Park 1 Piece Elongated Ergo Height Toilet" Soft Close - Toilet Seat Included 1.28 GPF 29-5/8"H x 14-1/2"W x 28-3/4"D (16-1/2" Rim Height) / Floor Mounted	21-221	White	Gerber Plumbing Fixtures, a brand of Globe Union Branded Products	Guestroom	Accessible Bathroom
		WCL-WCL13K	"Reach Comfort Height 1 pc Elongated Toilet" Quiet Close - K-4008 Toilet Seat Included 1.28 GPF 28.7" x 14.3" x 29" (16.5" H Rim Height) / Floor Mounted	K-78080-0	White	Kohler Company	Guestroom	Accessible Bathroom

Note 1: Items shown with "(UPG)" or "(Upgrade)", are an upgrade to standard items.
Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
URN-01			***URINAL (A1)***					
		URN-URN01A	"Washbrook Universal Urinal" 1.0 GPF 18-7/8" x 14-1/8" x 26-1/8" / Wall Mounted	6590.001.020	White	American Standard Companies Inc.	Public	Restroom
		URN-URN01K	"Freshman Urinal" 1.0 GPF 14-1/4" H x 16-1/4" W x 12-1/2" D / Wall Mounted	K-4989-T-0	White	Kohler Company	Public	Restroom
			URINAL (A2) - ALTERNATE FOR WATER CONSERVATION					
		URN-URN02K	"Bardon High Efficiency Urinal" 0.50 GPF (WaterSense Certified) 26-7/8" H x 18" W x 14-1/8" D / Wall Mounted	K-4904-ET-0	White	Kohler Company	Public	Restroom
			FLUSH VALVE (B1)					
		URN-FLV21A	Exposed Flush Valves - Manual Operation ADA Compliant 1.0 GPF / Wall Mounted	6045.101.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		URN-FLV21K	Exposed Flush Valves - Manual Operation ADA Compliant 1.0 GPF / Wall Mounted	K-13518-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		URN-FLV21M	M-Dura Exposed Flush Valves - Manual Operation ADA Compliant 1.0 GPF / Wall Mounted	8312M10	Chrome (Polished)	Moen Incorporated	Public	Restroom

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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
URN-01			***FLUSH VALVE (B2) - UPGRADE OPTION***					
		URN-FLV31A	Selectronic Sensor Operated Flush Valve ADA Compliant 1.0 GPF / Wall Mounted	6063.101.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		URN-FLV31K	"Washdwn Flushometer" Touchless "Wave" Technology ADA Compliant 1.0 GPF / Wall Mounted	K-10676-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		URN-FLV31M	M-Power Sensor Operated Flush Valve ADA Compliant with manual override 1.0 GPF / Wall Mounted	8312	Chrome (Polished)	Moen Incorporated	Public	Restroom
			FLUSH VALVE (B3) - ALTERNATE FOR WATER CONSERVATION TO BE USED WITH 0.50 GPF URINAL					
		URN-FLV35A	Selectronic Sensor Operated Flush Valve ADA Compliant 0.50 GPF / Wall Mounted	6063.051.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		URN-FLV35K	"Exposed Flush Valve" Touchless "Wave" Technology 0.50 GPF / Wall Mounted	K-10675-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		URN-FLV35M	M-Power Sensor Operated Flush Valve ADA Compliant with manual override 0.50 GPF / Wall Mounted	8315	Chrome (Polished)	Moen Incorporated	Public	Restroom

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Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
URN-02			***URINAL (ADA) (A1)***					
		URN-URN01A	"Washbrook Universal Urinal" 1.0 GPF 18-7/8" x 14-1/8" x 26-1/8" / Wall Mounted	6590.001.020	White	American Standard Companies Inc.	Public	Restroom
		URN-URN01K	"Freshman Urinal" 1.0 GPF 14-1/4" H x 16-1/4" W x 12-1/2" D / Wall Mounted	K-4989-T-0	White	Kohler Company	Public	Restroom
			URINAL (ADA) (A2) - ALTERNATE FOR WATER CONSERVATION					
		URN-URN02K	"Bardon High Efficiency Urinal" 0.50 GPF (WaterSense Certified) 26-7/8" H x 18" W x 14-1/8" D / Wall Mounted	K-4904-ET-0	White	Kohler Company	Public	Restroom
			FLUSH VALVE (B1)					
		URN-FLV21A	Exposed Flush Valves - Manual Operation ADA Compliant 1.0 GPF / Wall Mounted	6045.101.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		URN-FLV06K	Exposed Flush Valves - Manual Operation ADA Compliant 1.0 GPF / Wall Mounted	K-13518-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		URN-FLV02M	M-Dura Exposed Flush Valves - Manual Operation ADA Compliant 1.0 GPF / Wall Mounted	8312M10	Chrome (Polished)	Moen Incorporated	Public	Restroom

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Note 2: Standard Finish for Guestroom Trim is Chrome (Polished or Bright), unless noted otherwise.
Note 3: Standard Finish for Public & Employee Restroom Trim is Chrome (Polished or Bright) (Noted otherwise if not available).
Note 4: Church or Bemis Seats are suggested due to improved mounting brackets.

Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
URN-02			***FLUSH VALVE (B2) - UPGRADE OPTION***					
		URN-FLV31A	Selectronic Sensor Operated Flush Valve ADA Compliant 1.0 GPF / Wall Mounted	6063.101.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		URN-FLV04K	"Exposed Flush Valve" Touchless "Wave" Technology 1.0 GPF / Wall Mounted	K-10676-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		URN-FLV04M	M-Power Sensor Operated Flush Valve ADA Compliant with manual override 1.0 GPF / Wall Mounted	8312	Chrome (Polished)	Moen Incorporated	Public	Restroom
			FLUSH VALVE (B3) - ALTERNATE FOR WATER CONSERVATION TO BE USED WITH 0.50 GPF URINAL					
		URN-FLV08A	Selectronic Sensor Operated Flush Valve ADA Compliant 0.50 GPF / Wall Mounted	6063.051.002	Chrome (Polished)	American Standard Companies Inc.	Public	Restroom
		URN-FLV02K	"Exposed Flush Valve" Touchless "Wave" Technology 0.50 GPF / Wall Mounted	K-10675-SV-CP	Chrome (Polished)	Kohler Company	Public	Restroom
		URN-FLV08M	M-Power Sensor Operated Flush Valve ADA Compliant with manual override 0.50 GPF / Wall Mounted	8315	Chrome (Polished)	Moen Incorporated	Public	Restroom

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
WCR		***WATER COOLER***						
		NOTE-	To be selected by Project Architect/Engineer / Recessed		Stainless Steel		Public	(As Required)
WCR-51		***HYDRATION STATION***						
		WCR-WHS51HA	Touch-free electric sensor water dispenser with carbon block filter with lifecycle control. 3-15/16"D x 15"W x 30-1/4"H / Semi-Recessed	2000SN	Stainless Steel / ABS	Haws Corp.	Public	(As Required)
MOP-01		***MOP SINK (A)***						
		MOP-MSK01MS	Mop Service Basin - 1 Piece, Molded fiberglass Construction, integrally molded center drain with seal. Removable stainless steel strainer. 24" x 24" x 8-1/4" / Floor Mounted	62M	White	E.L. Mustee & Sons	Back-of-House	(As Required)
		MOP-MSK01f	Mop Service Basin - 1 Piece, Molded stone Construction, integrally molded center drain with seal. Removable stainless steel strainer. 24" x 24" x 10" / Floor Mounted	MSBID2424-100	White	Fiat Products, A Crane Plumbing Company	Back-of-House	(As Required)
		FAUCET (B)						
		MOP-FCT11A	Exposed Yoke Wall Mount Utility Faucet with Top Brace / Wall Mounted	8344.212	Polished Chrome	American Standard Companies Inc.	Back-of-House	(As Required)
		MOP-FCT09M	2-Handle Service Sink Faucet-threaded spout for hose connection, lever handles and pail hook 9-3/8" Wall-to-spout outlet / 8" Centers	8230	Rough Chrome	Moen Incorporated	Back-of-House	(As Required)

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
MOP-01			***FAUCET (B)***					
		MOP-FCT09F	Exposed Yoke Wall Mount Utility Faucet with with vacuum breaker, adjustable wall brace, pail hook and 3/4" thread on spout / Wall Mounted	830-AA-000	Polished Chrome	Fiat Products, A Crane Plumbing Company	Back-of-House	(As Required)
			HOSE HOLDER (C)					
		MOP-HSH01M	Heavy Duty 5/8" diameter, 36" Rubber Hose and Spring Loaded Molded Rubber Hose Hoder on Stainless Steel Wall Plate 3-1/2" x 5" / Wall Mounted	8199	Stainless Steel	Moen Incorporated	Back-of-House	(As Required)
		MOP-HSH01MS	Heavy Duty 5/8" diameter, 31" Rubber Hose and Spring Loaded Molded Rubber Hose Hoder on Stainless Steel Wall Plate / Wall Mounted	65.700	Stainless Steel	E.L. Mustee & Sons	Back-of-House	(As Required)
		MOP-HSH01F	Heavy Duty 5/8" diameter, 30" Rubber Hose and Spring Loaded Molded Rubber Hose Hoder on Stainless Steel Wall Plate / Wall Mounted	832-AA-000	Stainless Steel	Fiat Products, A Crane Plumbing Company	Back-of-House	(As Required)
			MOP HANGER (D)					
		MOP-MPH01M	Three spring-loaded, molded rubber mop holders attached to stainless steel wall plate. 3-1/2" x 26" / Wall Mounted	8198	Stainless Steel	Moen Incorporated	Back-of-House	(As Required)
		MOP-MPH01MS	Three spring-loaded, molded rubber mop holders attached to stainless steel wall plate. 3" x 24" / Wall Mounted	63.600	Stainless Steel	E.L. Mustee & Sons	Back-of-House	(As Required)

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
MOP-01		***MOP HANGER (D)***						
		MOP-MPH01F	Three spring-loaded, molded rubber mop holders attached to stainless steel wall plate. 3" x 24" / Wall Mounted	889-CC-000	Stainless Steel	Fiat Products, A Crane Plumbing Company	Back-of-House	(As Required)
		WALL GUARD (E)						
		MOP-WGD01MS	12" High, 20 Gauge, #304 Stainless Steel wall guard / Wall Mounted	67.2424	Stainless Steel	E.L. Mustee & Sons	Back-of-House	(As Required)
		MOP-WGD01F	Two (2), 12" High, 20 Gauge, #304 Stainless Steel wall guard plus corner bracket / Wall Mounted	MSG2424-000	Stainless Steel	Fiat Products, A Crane Plumbing Company	Back-of-House	(As Required)
CLO		***CLEANOUT***						
		NOTE-	To be selected by Project Architect/Engineer				Per Code	(As Required)
EWS		***EYE WASH***						
		NOTE-	To be selected by Project Architect/Engineer				Per Code	(As Required)
FLD		***FLOOR DRAIN***						
		NOTE-	To be selected by Project Architect/Engineer				Public Back-of-House	(As Required)
		NOTE-	To be selected by Project Architect/Engineer				Public	Restroom / Employee Restroom
FSK		***FLOOR SINK***						
		NOTE-	To be selected by Project Architect/Engineer				Per Code	(As Required)

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Plan Mark (New)	Plan Mark (Old)	Cut Sheet Index	Description	Model No.	Finish	Manufacturer	Area	Location
LIT			***LINT INTERCEPTOR***					
			NOTE- To be selected by Project Architect/Engineer				Back-of-House	Laundry
HYD			***WALL HYDRANT***					
			NOTE- To be selected by Project Architect/Engineer				Exterior	(As Required)
RDR			***ROOF DRAIN***					
			NOTE- To be selected by Project Architect/Engineer				Exterior	Roof

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SECTION 23 05 00
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Piping materials and fittings
2. Joining materials
3. Dielectric fittings
4. Mechanical sleeve seals
5. Piping Specialties
6. Grout
7. Piping Installation
8. Equipment Installation
9. Concrete Bases.
10. Erection of Metal Supports
11. Cutting and Patching
12. Grouting

1.2 REFERENCES

A. The American Society of Mechanical Engineers (ASME) Publications:

1. B1.20.1 "Pipe Threads, General Purpose, Inch"
2. B16.21 "Nonmetallic Flat Gaskets for Pipes Flanges"
3. B18.2.1 "Square and Hex Bolts and Screws, Inch Series"

B. ASTM International (ASTM) Publications:

1. A47 "Standard Specification for Ferritic Malleable Iron Castings"
2. A53 "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
3. A126 "Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings"
4. A536 "Standard Specification for Ductile Iron Castings"
5. B32 "Standard Specification for Solder Metal"
6. C1107 "Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)"
7. D2235 "Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings"
8. D2564 "Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems"

9. D2657 "Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings"
10. D2672 "Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement"
11. D2846 "Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems"
12. D2855 "Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings"
13. D3138 "Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components"
14. F402 "Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings"
15. F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe"
16. F493 "Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings"
17. F656 "Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings"

C. American Welding Society (AWS) Publications:

1. "Soldering Manual"
2. BRH "Brazing Handbook"
3. A5.8 "Specification For Filler Metals For Brazing And Braze Welding"
4. D1.1 "Structural Welding Code - Steel"
5. D10.12 "Guide for Welding Mild Steel Pipe"

D. American Water Works Association (AWWA) Publications:

1. C110/ANSI A21.10 " Standard for Ductile-Iron and Gray-Iron Fittings, 3 In.-48 In. (76 mm-1,219 mm), for Water "
2. C111/ANSI A21.11 "Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"

E. Copper Development Association (CDA) Publications:

1. "Copper Tube Handbook"

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.

3. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

2. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

a. Planned piping layout, including valve and specialty locations and valve-stem movement.

b. Clearances for installing and maintaining insulation.

c. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.

d. Equipment and accessory service connections and support details.

e. Exterior wall and foundation penetrations.

f. Fire-rated wall and floor penetrations.

g. Sizes and location of required concrete pads and bases.

h. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.

i. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

j. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.5 QUALITY ASSURANCE

A. Equipment Selection:

1. Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases.

2. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design requirements. See drawings for equipment schedules and requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Section 08 31 13 - "Access Doors and Frames."

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.8 POSTED OPERATING INSTRUCTIONS

A. Provide and post operating instructions for all mechanical systems.

PART 2 PRODUCTS

2.1 HVAC PIPE AND PIPE FITTINGS

A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.
    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B32.
1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.

F. Brazing Filler Metals: AWS A5.8.
1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.
3. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements: Manufacturer's standard solvent cements for the following:
1. ABS Piping: ASTM D2235.
2. CPVC Piping: ASTM F493.
3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
4. PVC to ABS Piping Transition: ASTM D3138.

H. Plastic Pipe Seals: ASTM F477, elastomeric gasket.

I. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

J. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
1. Sleeve: ASTM A126, Class B, gray iron.
2. Followers: ASTM A47 malleable iron or ASTM A536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.3 DIELECTRIC FITTINGS

A. Approved Manufacturers:

1. Anvil International, Inc. (603-422-8000)
2. Central Plastics Co. (800-654-3872)
3. Grinnell Mechanical Products, A Tyco International Company (800-500-4768)
4. Mueller Industries, Inc. (800-348-8464)
5. Perfection Corporation (800-544-6344)
6. Victaulic Co. of America (800-742-5842)

B. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

C. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

D. Insulating Material: Suitable for system fluid, pressure, and temperature.

E. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

F. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.

G. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Provide separate companion flanges and steel bolts and nuts for 150-psig minimum working pressure as required to suit system pressures.

H. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

2.4 HVAC SLEEVES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
5. Underdeck Clamp: Clamping ring with set screws.

2.5 HVAC SLEEVE SEALS

A. Approved Manufacturers:

1. Metraflex Inc. (800-621-4347)
2. PSI-Thunderline/Link-Seal (800-423-2410)

B. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.6 HVAC SPECIALTIES

A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.

2. OD: Completely cover opening.

3. Cast Brass: Split casting, with concealed hinge and set screw.

a. Finish: Polished chrome-plate.

4. Cast-Iron Floor Plate: One-piece casting.

B. Grout:

1. Non-shrink, Nonmetallic Grout: ASTM C1107, Grade B.

a. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.

b. Design Mix: 5000-psig, 28-day compressive strength.

c. Packaging: Premixed and factory packaged.

PART 3 EXECUTION

3.1 HVAC PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install HVAC piping as described below, unless piping Sections specifies otherwise. Individual Division 22 and 23 Piping Sections specifies unique piping installation requirements.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings as required by Division 01 Sections and as outlined in Part 1 of this section.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve operation and servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.

2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw, and chrome-plated finish.

3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast brass with concealed hinge, set screws, and chrome-plated finish.

5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping rings where required.

2. Build sleeves into walls and slabs as work progresses.

3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS (DN150).

b. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS (DN150) and larger, penetrating gypsum-board partitions.

4. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing. Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealant. Refer to Section 07 92 00 "Joint Sealants" for materials.

6. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

O. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.

3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

P. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stopping materials. Refer to Section 07 84 00 - "Firestopping" for materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

3. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."

4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.

c. Align threads at point of assembly.

d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.

e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.

7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and

gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

   a. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.

   b. CPVC Piping: ASTM D2846 and ASTM F493.

   c. PVC Pressure Piping: ASTM D2672.

   d. PVC Non-pressure Piping: ASTM D2855.

9. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657 procedures and manufacturer's written instructions.

   a. Plain-End Pipe and Fittings: Use butt fusion.

   b. Plain-End Pipe and Socket Fittings: Use socket fusion.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.

2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.

4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights is not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Owner’s Representative.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope as specified in other Division 22 sections.

F. Clearance from Electrical Equipment: Piping and ductwork are prohibited in electric rooms and closets, elevator machine rooms and installation over transformers, switchboards and motor control centers.

3.3 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig 28-day compressive-strength concrete and reinforcement as specified in Section 03 30 00 - "Cast-in-Place Concrete."

3.4 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

C. Prime and paint all metal supports per Section 09 90 00 requirements similar to “Pipes and Mechanical Equipment”.

3.5 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

C. Refer to Division 01 Sections for additional requirements.

3.6 GROUTING

A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 23 05 00 (15050)

SECTION 230513 - ELECTRICAL MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single phase electric motors.

B. Three phase electric motors.

1.02 RELATED DOCUMENTS

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

B. Section 230514 – Variable-Frequency Drive – Motor Controllers

C. Section 232300 – Refrigerant Piping and Split System Equipment

D. Section 233413 – HVAC Fans

E. Section 237313 – Modular Indoor Central-Station Air-Handling Units

1.03 REFERENCES

A. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2006.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying premium efficiency and power factor for three phase motors larger than 1 horsepower.

D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Conform to NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

A. Comply with requirements of Division 1.

PART 2 PRODUCTS

2.01 ELECTRIC MOTOR GENERAL CONSTRUCTION AND REQUIREMENTS

A. Furnish electric motors as required for each motor driven unit. All motors must conform in every respect to the standard specifications of NEMA and bear nameplate of manufacturer, with current operating characteristics noted thereon. Motors shall be U.L. approved.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. All electric motors shall be sized to meet the horsepower requirements of the driven unit at design characteristics including all V-belt and/or drive and coupling losses which are incurred without loading the motor beyond its nameplate horsepower rating. Where V-belt drives are employed, the motor horsepower nameplate ratings shall not be less than 115% of the driven unit brake horsepower requirements.

D. All motors shall be provided with ball roller bearings, and shall have provisions for lubrication unless specified otherwise. Motors shall be quiet when operating under full load operations. See schedules on the Mechanical/Electrical (ME) drawings for capacities.

E. Single phase motors shall be capacitor start, drip-proof. Three phase motors general purpose, squirrel cage induction type unless specified otherwise. Minimum service factors shall be 1.15. All motors single speed, 1750 rpm, unless specified otherwise for specific equipment.

F. Electric motor characteristics shall be as indicated on the drawings.

G. All three phase motors for mechanical equipment rated 1 horsepower and larger shall meet NEMA Premium Efficiency standards as shown on the following table. Motors shall be labeled to comply with NEMA Standard MG1-12.53 with the nominal efficiency printed on the nameplate. Efficiency to be based on a dynamometer test per IEEE, Standard 112, Method B.
   1. Minimum efficiency shall be provided per schedule.

MOTOR SCHEDULE

	Open Drip-Proof (ODP)			Totally Enclosed Fan-Cooled (TEFC)		
	1200 RPM	1800 RPM	3600 RPM	1200 RPM	1800 RPM	3600 RPM
HP						
1	82.5	85.5	77	82.5	85.5	77
1.5	86.5	86.5	84	87.5	86.5	84
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91	88.5	91	91.7	89.5
10	91.7	91.7	89.5	91	91.7	90.2

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.02 WIRING

A. All 120V and low voltage control wiring for equipment provided by this Contractor shall be responsibility of this Contractor unless specified otherwise and clearly stated.

B. Electrical work shall comply with the requirements of the current applicable National Electrical Code and Division 26. Where this specification or the plans indicate requirements in excess of those of NEC, the compliance with NEC will not relieve the Contractor from furnishing and installing work as shown or specified.

C. All switching, protective devices and controls for equipment furnished under these Specifications shall be identified with black-white-black laminated 1/8" plastic plates. Plates shall be attached with self-tapping screws.

END OF SECTION

SECTION 230519 - METERS AND GAUGES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Thermometers and thermometer wells.

1.02 RELATED DOCUMENTS

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

B. Section 230913 – Instrumentation and Control Devices for HVAC

C. Section 233100 - HVAC Ducts and Casing

D. Section 234000 - HVAC Air Cleaning Devices

1.03 REFERENCES

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 1998 (Pub. 2000).

B. ASTM E 1 - Standard Specification for ASTM Thermometers; 2003a.

C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers; 1998 (Reapproved 2003).

D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories, Inc.; 2005.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 THERMOMETERS – AIR

A. Thermometer:
   1. Case: Stainless steel, 5”, clear glass window.
   2. Scale: Black on white.
   3. Stem: Stainless steel, angle adjustable stem.

B. Acceptable Manufacturers:
   1. Weiss
   2. March

3. Trerice
4. U S Gauge
5. Weksler

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install thermometers in air duct systems on flanges.

C. Provide instruments with scale ranges selected according to service with largest appropriate scale.

D. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.02 SCHEDULE

A. Thermometer – Air
   1. Location:
      a. Fresh air intakes
      b. Air handling system – supply fan discharge
      c. After each heating/cooling coil
      d. Supply air inlet to heat recovery cell.
      e. Exhaust discharge after heat recovery cell.

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hangers and Supports.

1.02 RELATED DOCUMENTS

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

B. Section 230523 – General Duty Valves for HVAC Piping.

C. Section 231123 – Natural Gas Piping.

D. Section 232300 – Refrigerant Piping

1.03 REFERENCES

A. ASME B31.9 – Building Services Piping; The American Society of Mechanical Engineers; 2008.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. All individual pipes shall be supported with adjustable clevis hangers of sizes as required to encompass insulated pipe. Provide sheet metal shields at all hanger points on insulated pipes.
   1. Anvil Fig. 260 or approved equal. (cast iron, steel and insulated copper pipe)
   2. Anvil Fig. CT-65 or approved equal. (uninsulated copper pipe)

B. All individual pipes shall be supported with adjustable ring hangers of sizes as required to encompass the insulated pipe. Provide sheet metal shields at all hanger points on insulated pipes.
   1. Anvil Fig. 97 or approved equal. (cast iron, steel and insulated copper pipe)
   2. Anvil Fig. CT-99 or approved equal. (uninsulated copper pipe)

C. "Trapeze" hangers and/or tunnel piping supports shall be Unistrut, Power Strut, or B-Line channel for pipe size 3" and smaller, for pipe 4" to 6" use 2" x 2" x 1/4" angle iron, for pipe size 8" to 12" use 3" x 3" x 3/8" angle iron using the appropriate diameter rod that will sufficiently support the total weight of all of the pipe and their contents being supported and the rod nutted on both sides of the hanger. Make provisions to pitch piping as required.

D. Hanger Rods etc.: Mild steel continuous threaded rod, heavy washers and heavy hex nuts.

2.03 ATTACHMENTS TO STRUCTURE

A. Concrete
   1. Poured - for loads between 400 lbs and 1140 lbs.
      a. Anvil Fig. 282.
   2. Poured - For loads up to 400 lbs.
      a. Anvil Fig. 285 or U channel type; B - Line B221 or Unistrut.
   3. Precast - Tapered wedge with locking sleeve: Quick Bolt.

B. Steel Beam Structure
   1. Beam Clamp
      a. For loads up to 1070 lbs - Anvil Fig 94 or approved equal.
      b. For loads up to 470 lbs - Anvil Fig 93 or approved equal.
   2. Welded beam attachment - Anvil Fig. 66.
   3. Steel washer and heavy nut for split joists.
   4. Angle or channel iron support spanning between beams and joists.

C. Wood
   1. Drill and use through bolts nutted on both sides of joist and malleable iron eye sockets.

2.04 VERTICAL PIPE SUPPORTS

A. All vertical piping shall be supported at each floor using riser clamps.
   1. Anvil Fig. 261. (cast iron, steel, and insulated copper pipe)
   2. Anvil Fig. CT 121. (uninsulated copper pipe)

2.05 HANGER INSERTS

A. Concrete inserts for loads between 400 and 1140 lbs.
   1. Anvil Fig. 282 or approved equal.

B. Concrete inserts for loads up to 400 lbs.
   1. Anvil Fig 285 or approved equal.

2.06 SHEET METAL SHIELDS

A. Sheet metal shields shall be Anvil Fig. 167 or galvanized sheet metal of equal gauge thickness.

2.07 PIPE COVERING PROTECTION SADDLE

A. For piping on pipe roller type support steel saddles.
   1. Anvil Fig. 160 through 165 or 165A and 166A as required.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL REQUIREMENTS

A. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

B. Provide all hangers and supports as required.

3.02 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   8. Whenever copper piping comes directly in contact with steel support system, it shall be this Contractor's responsibility to wrap the pipe with two layers of 3M's #33 electrolytic tape. The length of tape shall be such to provide 2" overlap on each side of support.
   9. Insulated pipe support shall be supported with polysiocyanurate pipe insulation the same thickness as insulated pipe. Install between pipe and vapor barrier.
   10. Supports shall be sized for weights and pipe sizes encountered.
   11. Supports shall properly compensate for all thermal expansion and contraction.

B. Horizontal Hanger Spacing Schedule

   1. Steel Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
1/2" tube only	5'	1/4"
1/2" - 1"	7'	3/8"
1-1/4" - 1-1/2"	9'	3/8"
2"	10'	1/2"
2-1/2"	11'	1/2"
3"	12'	1/2"

   2. Copper Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
Up to 1-1/4"	6'	3/8"
1-1/2"	9'	3/8"
2"	9'	3/8"
2-1/2"	10'	1/2"

3.03 VERTICAL PIPE SUPPORTS

A. Pipes with 25 feet of vertical height or more, without offsets shall be supported vertically as specified in Part 2 and/or detailed on the drawings.

B. Supports shall be sized for weights and pipe sizes encountered.

C. Supports shall properly compensate for all thermal expansion and contraction.

3.04 BRACKETS, BRACES AND SUPPORTS

A. Provide brackets, braces or reinforcing angles as may be required in all partitions, not sufficient in themselves to support fixtures or other wall mounted equipment included in this specification.

B. Pipe shall be supported from the building structure independently or from a separate support, no pipe line shall be supported from another pipe line or piece of equipment.

C. No equipment shall be supported by the piping system itself. All units shall be supported in a manner to allow service without removing large piping segments or valves. Provide structural members as required.

D. On thin masonry or hollow tile walls that are to be finished on opposite side of wall, use 3/8" brass through bolts extended entirely through wall with 3" cut washer on opposite side of wall. Bolt heads and washers shall be concealed under wall finish on opposite side of wall. On walls of accessible pipe spaces, use 3/8" brass through bolts and 3" cut washers exposed in pipe spaces.

E. On brick, masonry block, hollow tile or concrete walls not finished on opposite side of wall, use brass toggle bolts or 3/8" brass bolts extending at least 3" into wall secured in place lead inserts and caulked with silicone type caulk.

END OF SECTION

SECTION 230548 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolators.

1.02 RELATED DOCUMENTS

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

B. Section 233414 - HVAC Fans

C. Section 237313 - Modular Indoor Central Station Air Handling Unit

1.03 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide schedule of vibration isolator type with location and load on each.

C. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.

D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 PRODUCTS

2.01 DUCTWORK

A. Flexible duct connection material shall be neoprene-coated glass fiber or fabric type, 6" wide with metal edging for fastening.

B. Acceptable Manufacturers:
   1. Vent-Fan
   2. United/McGill
   3. Mercer Rubber Company
   4. Titus
   5. General Rubber
   6. Industrial Acoustics
   7. Elgen

2.02 EQUIPMENT

A. Vibration isolator shall be selected in accordance with the weight distribution so as to provide reasonably uniform deflection. Deflectors shall be 1" or as noted on drawings.

B. Equipment mounting type schedule based on Mason Industries Model Number.
   1. Type D: Vibration hangers shall contain a steel spring and 0.3" deflection neoprene element in series. The 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 the hanger rod to swing through a 30 degrees arc before contacting the hole and short circuiting the spring. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include a scale drawing of the hanger showing the 30 degrees capability. Hangers shall be type 30N.
   2. Acceptable Manufacturers:
      a. Vibration Mountings
      b. Vibration Eliminator
      c. Korfund Dynamics
      d. Industrial Acoustics

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Ductwork:
   1. Connections to be made with 1" x 1" x 1/8" angle on all rectangular openings and two #14 gauge 1" band on all round openings. Use 5/16" stove bolts or self-tapping screws located 6" o.c. for fastening flexible duct to ductwork.
   2. Flexible connectors shall be 6" wide and installed in a 4" space to allow for ample slack

C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

D. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

E. Provide pairs of horizontal limit springs on fans with more than 6.0 inches WC static pressure, and on hanger supported, horizontally mounted axial fans.

F. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance.
   1. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.02 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report. Include static deflections.

END OF SECTION

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Labels.

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 1996 (Reaffirmed 2002).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Brady Corporation.

B. Champion America, Inc.

C. Seton Identification Products.

2.02 IDENTIFICATION – EQUIPMENT NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/2 inch.
   3. Background Color: Black.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 IDENTIFICATION – PIPE

A. Color: Conform to ASME A13.1.

B. Plastic Tape Pipe Labels: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Pipe: Labels shall describe the contents and direction of flow. Labels shall be secured to pipe with full self-adhesive banding around pipe at each end of label. Labels shall be per the schedule in Part 3.

2.05 IDENTIFICATION – VALVES

A. Brass metal tags.

B. Control valves shall be tagged as to service and normal position.

C. Other valves tagged as to service and function.

D. Control valve tags shall have black background, other valves tags shall have colors corresponding to service described above.

E. Valve list shall be included into operation and maintenance manuals.

2.06 IDENTIFICATION - EQUIPMENT

A. Nameplates: Laminated three-layer plastic with engraved letters.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install pipe labels in accordance with manufacturer's instructions.

D. Install tape pipe labels complete around circumference of pipe in accordance with manufacturer's instructions.

E. Identify air handling units, fans, etc., with plastic nameplates.

F. Label all ductwork at damper locations, describe damper type. Provide minimum .5 inch high black letters on yellow background.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify valves in main and branch piping with tags. Valve list shall be included in operation and Maintenance Manual.

I. Identify air terminal units and radiator valves with numbered tags.

J. Tag automatic controls, instruments, and relays. Key to control schematic.

K. Identify piping, concealed or exposed, with tape pipe labels. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

L. All gas piping, except exposed in mechanical rooms, shall be labeled every 5'-0".

3.03 PIPE IDENTIFICATION SCHEDULE

CONDENSATE DRAIN	Y/B
REFRIGERANT LIQUID	Y/B
REFRIGERANT SUCTION	Y/B
NATURAL GAS	Y/B

Y/B =YELLOW BACKGROUND/BLACK LETTERS		
G/W = GREEN BACKGROUND/WHITE LETTERS		
R/W = RED BACKGROUND/WHITE LETTERS		
B/W = BLUE BACKGROUND/WHITE LETTERS		
Pipe Size	Band Width	Letter Height
1/2" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
10" & UP	32"	3-1/2"

END OF SECTION

SECTION 230593

ADJUSTING AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 RELATED DOCUMENTS

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

1.03 REFERENCES

A. AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Standard 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   3. SMACNA HVAC Systems Testing, Adjusting, and Balancing.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to functional testing.

C. Support Commissioning Team activities by measuring air leakage, verifying system flow rates, or troubleshooting air and water distribution issues as needed or as requested by the Commissioning Authority.

D. Cooperate with Controls Technician the calibration of duct static pressure, building static pressure and airflow measurement.

E. Coordinate VFD with startup to obtain minimum and maximum settings for fans and pumps.

F. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council, upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau:
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

G. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage tests are complete, all corrections completed.
   12. Pumps are rotating correctly.
   13. Proper strainer baskets are clean and in place.
   14. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

3.03 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.04 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. See Section 233413.

G. Vary branch air quantities by damper regulation.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Air Coils
   2. Terminal Heat Transfer Units
   3. Air Handling Units
   4. Fans
   5. Air Filters
   6. Air Terminal Units
   7. Air Inlets and Outlets

3.08 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer
   2. Model/Frame
   3. HP/BHP
   4. Phase, voltage, amperage; nameplate, actual, no load
   5. RPM
   6. Service factor
   7. Starter size, rating, heater elements
   8. Sheave Make/Size/Bore

B. V-Belt Drives:
   1. Identification/location
   2. Required driven RPM
   3. Driven sheave, diameter and RPM
   4. Belt, size and quantity
   5. Motor sheave diameter and RPM
   6. Center to center distance, maximum, minimum, and actual

C. Air Moving Equipment:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

D. Return Air/Outside Air:
1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

E. Exhaust Fans:
1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

F. Terminal Unit Data:
1. Manufacturer
2. Type, constant, variable, single
3. Identification/number
4. Size
5. Minimum static pressure
6. Minimum design air flow
7. Maximum design air flow

8. Maximum actual air flow
9. Inlet static pressure

G. Air Distribution Tests:
1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

H. Instrument Calibration Reports:
1. Instrument type and make
2. Serial number
3. Application
4. Dates of use
5. Dates of calibration

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.02 RELATED DOCUMENTS

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

B. Section 230553 - Identification for HVAC Piping and Equipment.

C. Section 233100 - HVAC Ducts and Casings

1.03 REFERENCES

A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

B. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2002.

C. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2004.

D. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2005.

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.

F. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials; 2005.

G. ASTM E 2336 – Standard Test Method for Fire Resistive Grease Duct Enclosure System

H. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

I. NFPA 255 – Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. UL 723 – Standard Method of Test of Surface Burning Characteristics of Building Materials; Underwriter’s Laboratories; 2003.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Acceptable manufacturer:
   1. Owens-Corning
   2. Johns Manville
   3. Certain Teed
   4. Knauf
   5. Dow
   6. Halsted

2.02 TYPE 2 - EXTERNAL FIBERGLASS BLANKET DUCT INSULATION

A. Ducts shall be insulated on the outside with 1-1/2" nominal thickness (1-1/8" installed thick) 1-1/2 lb. density flexible fiber blanket with an installed thermal conductance K = 0.24 Btu in./hr. sq. ft. or less at 75 degrees F and total insulated R value of 6.1 out of box.

B. Application
   1. Insulation shall be cut slightly longer than circumference of duct to insure full thickness at corners and provide a 2" staple lap. All insulation shall be applied with edges tightly stapled seam sealed with 3" wide pressure sensitive aluminum foil tape.
   2. The insulation shall be additionally secured to the bottom of all ducts 18" or wider by means of welded pins 12” on center and secured with speed clips. The protruding ends of the pins shall be cut off flush after the speed clips have been applied.

C. Vapor barrier
   1. Insulation shall be furnished with a factory applied foil-scrim-kraft facing consisting of an aluminum foil (minimum .7 mil thick) reinforced with fiber glass yarn mesh and laminated to 40 lb. chemically treated, fire resistant kraft. Where painting of insulation is required, provide a white all service jacket.

2. The vapor-barrier facing shall be thoroughly sealed with a tape where the pins have pierced through by applying a vapor adhesive to both surfaces as recommended by the manufacturer.
3. All joints and penetrations of the vapor barrier shall be sealed with 3" pressure sensitive aluminum foil tape. All cuts or tears shall be sealed with strips of the aluminum foil tape.

2.03 TYPE 4 - EXTERNAL FIBERGLASS BOARD DUCT INSULATION

A. Ducts shall be insulated on the outside with 2" thick 3 lb. density semi-rigid glass fiberboard with a thermal conductance K = 0.23 Btu in./hour sq. ft. degrees F or less at 75 degrees F and total insulated R value of 8.7 out of box.

B. Application
1. Impaling Over Pins: All insulation shall be applied with edges tightly butted. Insulation shall be impaled on pins welded to the duct 12" on center and secured with speed clips. The protruding ends of the pins shall be clipped off flush with the surface of the insulation.

C. Vapor Barrier
1. Insulation shall be furnished with a factory applied foil-scrim-kraft facing consisting of an aluminum foil (minimum .7 mil thick) reinforced with fiber glass yarn mesh and laminated to 40 lb. chemically treated, fire resistant kraft where a vapor barrier is required. Where painting of insulation is required, provide a white all service jacket, in lieu of aluminum foil.
2. All joints and penetrations of the vapor barrier shall be sealed with 3" wide aluminum foil pressure sensitive tape. All cuts or tears shall be sealed with strips of the aluminum foil tape.

2.04 TYPE 7 - INTERNAL FIBERGLASS DUCT LINER BOARD (SOUND INSULATION)

A. All ducts where indicated herein shall be sound insulated with 1" thick, 1-1/2 lb. density semi-rigid duct liner. The NRC value shall not be less than 0.75 according to ASTM Test Method C-423. Thermal conductance shall be K = 0.23 Btu in./hour sq. ft. degrees F or less at 75 degrees F and total insulated R value of 4.3. Liner shall not support mold or fungus growth and shall be tested per ASTM C-665.

B. Application
1. Velocities to 1,500 feet per minute.
a. The duct liner shall be applied with 100% coverage of approved fire resistant adhesive. On ducts over 20" wide or deep the liner shall be additionally secured with mechanical fasteners welded to the duct on maximum 15" centers. Fasteners shall start within 2" of the leading edge of each section and within 3" of the leading edge of all cross joints within the duct section. All exposed edges and the leading edge of all cross joints of the liner shall be heavily coated with an approved fire-resistant adhesive.
b. The duct liner shall be cut to assure snug closing corner joints, the coated mat surface of the liner shall face the air stream, transverse joints shall be neatly butted, and any damaged areas shall be heavily coated with an approved fire resistant adhesive.
2. Velocities from 1,500 to 4,000 feet per minute.

a. The duct liner shall be applied with 100% coverage of approved fire resistant adhesive. On horizontal runs, tops of ducts over 12" in width and/or sides over 16" in height shall be additionally secured with mechanical fasteners welded to the duct on a maximum of 15" centers. On vertical runs mechanical fasteners shall be spaced on maximum of 15" centers on all width dimensions over 12". Fasteners shall start within 2" of the leading edge of each section and within 3" of the leading edge of all cross joints within the duct section.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. External Duct Insulation Application:
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. Duct Liner (Sound Insulation)
1. Velocities to 1,500 feet per minute.
a. The duct liner shall be applied with 100% coverage of approved fire resistant adhesive. On ducts over 20" wide or deep the liner shall be additionally secured with mechanical fasteners welded to the duct on maximum 15" centers. Fasteners shall start within 2" of the leading edge of each section and within 3" of the leading

edge of all cross joints within the duct section. All exposed edges and the leading edge of all cross joints of the liner shall be heavily coated with an approved fire-resistant adhesive.

b. The duct liner shall be cut to assure snug closing corner joints, the coated mat surface of the liner shall face the air stream, transverse joints shall be neatly butted, and any damaged areas shall be heavily coated with an approved fire resistant adhesive.

3.03 DUCT INSULATION SCHEDULE

A. This contractor shall inspect that all ductwork has been properly sealed prior to installing insulation.

B. Extend ductwork insulation without interruption through walls, floor and similar ductwork penetrations, except where otherwise indicated.

C. Supply Air Ductwork
1. Supply ductwork shall be insulated with Type 2 as described in Part 2 - Products.

D. Return Air Ductwork
1. All return ductwork within unconditioned spaces shall be insulated with Type 2 as described in Part 2 - Products.

E. Internally Lined Ductwork (Supply, Return, and Transfer Duct)
1. All ducts as indicated below shall be lined with Type 7 insulation as described in Part 2 - Products.
   a. Supply ductwork - where indicated on the drawing.
   b. Return ductwork - where indicated on the drawing.
   c. Transfer ductwork - all ducts.
2. Duct sizes listed on the drawings are internal sizes. Where insulation is applied to the inside of the ducts, the metal size of the duct shall be increased in amount to result in internal dimensions equal to that shown on the drawings.
3. Where sound insulation is specified and/or shown for ducts which also require thermal insulation in this specification, the exterior thermal insulation thickness may be reduced or deleted such that the R value of the combined internal and the external insulation is not less than the R value of the thermal insulation specified.

F. Exhaust Ductwork
1. All exhaust ductwork shall be insulated a minimum of 10'-0", measured both from the exhaust fan inlet and/or outlet, with external board Type 4 insulation as described in Part 2 - Products.

G. Outdoor Air Ductwork
1. All ducts shall be insulated with Type 4 insulation as described in Part 2 - Products.

END OF SECTION

SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

1.02 RELATED DOCUMENTS

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

B. Section 232300 – Refrigerant Piping.

1.03 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.

B. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2000.

C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

D. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2007.

E. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2005.

F. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2006.

G. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 1990 (Reapproved 2004).

H. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2005.

I. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2003.

J. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

K. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2007.

L. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

M. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2003.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

B. Acceptable Manufacturers:
1. Knauf Insulation.
2. Johns Manville Corporation.
3. Owens Corning Corp.
4. CertainTeed Corporation.

2.02 TYPE 4 - FOAM PLASTIC TUBULAR AND SHEET INSULATION

A. Flexible elastomeric material with 3/4" thickness designed for varied services at temperatures between -40 degrees F and 220 degrees F.

B. Fittings for piping shall be insulated with mitered segments which match the material used. All butt joints shall be joined by sealing with a waterproof vapor barrier adhesive as recommended by the insulation manufacturer.

C. When applying sheet insulation to metal surfaces, brush on a coat of adhesive to the clean, dry metal, covering an area to the size of one sheet. Apply a brushcoat of adhesive to the back of the sheet, except for 1/2" wide border around the edges. After adhesive is on the metal surface and the sheet has dried to a nonsticky state, position sheet so that the edges overlap the previously installed sheets by 1/8". Apply light pressure to adhere a spot in the center of the sheet only and compress butt edges into place. Bond sheet by pressing firmly into place. Spread joints and coat with adhesive. DO NOT FILL JOINT WITH ADHESIVE.

D. For outdoor application, apply two coats of finish as recommended by the insulation manufacturer.

E. Acceptable manufacturers:

1. AP / Aramaflex 25/50 – Armacell International

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

G. Insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
   1. Application: On all piping 1-1/2 inches diameter or larger, except steam and steam condensate piping 3” and larger and hydronic piping 4” and larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Shall be the same thickness and contour as adjoining insulation, for pipes up thru and including 6” the length shall be 12” long, for piping 8” and larger it shall be 15” long.
   5. Insert material: Insulation material as described in Part 2.03 Products suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

3.03 HVAC PIPING INSULATION SCHEDULE

A. Condensate Drain Piping
   1. All runouts from cooling coil drain pans located above a suspended ceiling shall be insulated with 1/2" thick elastomeric material described by Type 4 in Part 2 Products.

B. Refrigeration Piping
   1. Suction line shall be insulated with elastomeric type as described by Type 4 in Part 2 – Products.
   2. Insulation thickness shall conform to tables in this section.

BASED ON ASHRAE STANDARD 90.1-2004:

C. Table 1 - Minimum Insulation Thickness for Pipe Sizes* (In.)

PIPING SYSTEM	TEMP & DEG. F.	</= 1"	1"-1.25"	1.5"-3"	4"-6"	8"+
Pumped condensate	Any	1.5	1.5	2	2	2
Chilled Water	40-60	.5	1	1	1	1
Refrigerant	39 or less	.5	1	1	1	1

* Piping exposed to outdoor air, increase thickness by 1/2"

END OF SECTION

SECTION 230913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temperature sensors.

B. Differential pressure sensors.

C. Damper operators.

D. Freezestat

E. Carbon dioxide sensors

1.02 RELATED DOCUMENTS

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

C. Section 220519 - Meters and Gages for Plumbing Piping

D. Section 230519 - Meters and Gages for HVAC Piping

E. Section 233300 - Air Duct Accessories

F. Section 230993 - Sequence of Operations for HVAC Controls.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors.

1. Revise shop drawings to reflect actual instrumentation installed.

C. Maintenance Data: Include recommended frequency of inspection and cleaning; cleaning method and cleaning materials; and frequency of re-calibration.

D. Warranty: Submit manufacturer's warranty, forms filled out in Owner's name, and copies sent to the manufacturer.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

A. Comply with requirements of Division 1.

PART 2 PRODUCTS

2.01 TEMPERATURE SENSORS – WALL MOUNTED – PUBLIC SPACES

A. Wall mounted temperature sensors for lobbies and public spaces shall meet the following requirements

1. White protective enclosure. There shall be no manufacturer's logo, name, or thermometer on the exposed wall plate.

2. Wall plate shall be primed for final coat in accordance with Architect.

3. 100 or 1,000 Ohm platinum RTD with a minimum temperature coefficient of resistance 0.00385 Ohm/Ohm/ºC.

4. Accuracy of 1ºF.

5. Range 32°F to 100°F.

B. Acceptable Manufacturer:

1. Coordinate with the Owner.

2.02 FREEZESTAT

A. Low limit thermostat (freezestats) shall meet the following requirements

1. Minimum 6 feet to maximum 20 feet of vapor tension element, to be serpentined across the coil face. Wire multiple sensors in series to provide minimum of one linear foot of sensor for every square foot of coil face area. Provide supports at bends and intermediate points as needed to prevent sagging or movement within the air stream.

2. Wire thermostats to trip a latching relay that will shut AHU fan down when HOA switch is in Hand or Auto position.

3. Manual reset.

4. Setpoint with scale adjustable manually from 32°F to 45°F

5. Rated for 16 Amp at 120 Volt.

6. Range 32°F to 100°F.

B. Acceptable Manufacturer:

1. Coordinate with the Owner.

2.03 DIFFERENTIAL PRESSURE SWITCH – AIR – FAN SHUTDOWN

A. Differential pressure switch shall meet the following requirements

1. UL approved.

2. Adjustable set point with range appropriate to application.

3. 1/4 inch compression fittings suitable for copper sensing tube.

4. Operating temperature range of 0°F to 160°F

5. Manual reset

B. Acceptable Manufacturer:

1. Coordinate with the Owner.

2.04 CONTROL DAMPERS

A. Smoke dampers and CF/S dampers are specified under Section 233300.

B. Control dampers are specified under Section 233300.

C. Control Damper Actuators - Electric

1. Provide spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.05 CO2 (CARBON DIOXIDE) SENSORS

A. ToxAlert International Model AIR 2000 Carbon Dioxide (CO_2) Indoor Air Quality sensors. The CO_2 sensor shall be non-dispersive infrared sensing type and shall be microprocessor based with linear outputs as specified. The range of the sensor shall be 0 to 2000 PPM CO_2, units with 0 to 3000 PPM range or higher are not acceptable.

B. The unit shall be designed for mounting on a single gang electrical box with all wiring entering the unit from the back of the unit. Unit wiring shall not be exposed.

C. The CO_2 sensor/transducer shall be powered by low voltage and have both a linear 0 to 10 volt and a 4 to 20 mA (milliamp) field selectable, output over its 9 to 2000 PPM range.

D. The units infrared source shall be derated and operated at a level to attain a fifteen (15) year source life. The CO_2 sensor/transducer shall be designed so that only span gas is required to check unit calibration. It shall be designed to automatically zero, so that zeroing gas is not required.

E. Sensor/transducer accuracy shall be ±5% of reading or ±75 PPM CO_2; repeatability shall be ±20 PPM or less; maximum annual drift ±75 PPM CO2.

F. Sensors shall be capable of sending output to modulating damper motor. Sensor supplier shall provide mechanical contractor with interface and all information necessary to control damper based on CO2 level.

PART 3 EXECUTION

3.01 EXAMINATION

A. Beginning of installation means installer accepts conditions as specified.

B. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with drawings and room details before installation.

C. Mount freeze protection thermostats using flanges and element holders.

D. Provide lockable guards on thermostats in entrances, public areas, and where indicated.

E. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

F. All power and low voltage wiring and shall be properly supported and run in a neat and workmanlike manner. All wiring exposed and in equipment rooms shall run parallel to or at right angles to the building structure. All wiring within enclosures shall be neatly bundled and anchored to prevent obstruction to devices and terminals.

G. The Contractor shall be responsible for all electrical installation required for a fully functional system. All wiring shall be in accordance to all local and national codes plus Division 26. All 120V voltage wiring, all low voltage wiring not in ceiling plenums and all low voltage wiring in equipment rooms shall be installed in conduit in accordance with Division 26. All electronic wiring shall be #18 AWG minimum and shielded, if required.

H. Ceiling Access Panels

1. The Contractor shall provide for access to all concealed devices.

END OF SECTION

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sequence of operation for:

1. PTAC units;
2. VRF system and associated Fan-coils;
3. Dedicated outdoor air system;
4. Exhaust Fans;
5. Natatorium Environmental System;
6. Miscellaneous electric heaters.

1.02 RELATED DOCUMENTS

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

B. Section 230913 - Instrumentation and Control Devices for HVAC.

1.03 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

1. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures.
2. Include at least the following sequences:
    a. Start-up.
    b. Warm-up mode.
    c. Normal operating mode.
    d. Unoccupied mode.
    e. Shutdown.
    f. Capacity control sequences and equipment staging.
    g. Temperature and pressure control, such as setbacks, setups, resets, etc.
    h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.

i. Effects of power or equipment failure with all standby component functions.

j. Sequences for all alarms and emergency shut downs.

k. Seasonal operational differences and recommendations.

l. Interactions and interlocks with other systems.

3. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

5. Include operating schedules.

C. Hand-Off-Auto function: HOA switch may be provided by the equipment manufacturer, by Division 26, or as part of a speed control unit (VFD).

1. When furnished integral with equipment, manufacturer shall determine HOA functionality.

2. When HOA function is provided with the VFD, or is furnished and installed by Division 26:

a. In Hand position, system shall be under manual control.

b. In Off position, system shall be in the Safety default position.

c. In Auto position, system shall be under the control of the BMCS.

D. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

1. Label with settings, adjustable range of control and limits.

2. Include flow diagrams for each control system, graphically depicting control logic.

3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

4. Include preliminary graphic displays indicating mechanical system components, control system components, and controlled function status and value.

5. Include a key to abbreviations.

E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

F. Occupied hours shall be determined by the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PTAC UNITS (ALL)

A. Units shall heat or cool and ventilate their spaces, 24 hours per day, 7 days per week. Units shall deliver 35 CFM of tempered outside air whenever room is occupied, regardless of the space temperature setpoint on the Thermostat.

B. Units shall be controlled by a remote Thermostat. The Thermostat shall be adjustable by the room occupant. The units shall have an alarm sent to the Owner, upon room space temperatures below 50 degrees F. or above 90 degrees F. (adjustable).

3.02 SPLIT-SYSTEM FAN COIL UNITS (VRF SYSTEM)

A. Service: As shown on the drawings.
B. In units delivering over 2000 cfm, provide duct mounted addressable Smoke Detector which shall stop unit and notify building fire alarm system upon detection of smoke.
C. Provide each fan-coil unit with individual fully programmable thermostat, complete with fan selector and sub-base with fan ON/OFF/AUTO switch.
D. With system switch in "AUTO" position, heating or cooling shall be provided as required via automatic changeover, fan shall run continuously.
E. With system switch in "COOL" position, cooling shall cycle on in stages when space temperature exceeds thermostat set point.
F. With system switch in "HEAT" position, heat shall cycle on in stages when space temperature is below thermostat set point.

3.04 MUA (Makeup Air Unit)

A. Unit shall be calibrated to provide "Neutral" air temperature (Owner-selected) within +/- 2 degrees F., at between 80%-100% rated air volume delivery. System shall run continuously.
B. Air volume to be controlled by duct pressure sensors. Certain supply ducts will have modulating dampers, controlled by CO2 sensors, which will reduce airflow resulting in increased air pressure within duct. CO2 level which triggers damper open condition shall be set by HVAC contractor in compliance with ASHRAE recommendations. CO2 sensors shall control dampers as follows: minimum 25% open (when CO2 level is below set point); maximum 100% (when CO2 level exceeds setpoint).

3.05 Electric Unit Heaters

A. Service: As shown on the drawings.

B. Integral thermostat shall cycle fan and resistance heat to maintain space set point temperature.

3.06 Public Toilet Room Exhaust.

A. The exhaust fans shall be energized by occupancy sensors and shall run for 10 minutes after occupancy is last detected.

3.07 Mechanical Room and Electrical Room Exhaust.

A. Each space shall be controlled by a wall mounted thermostat. When the space temperature exceeds the set point, a signal shall be sent to open the outside air damper and start the exhaust fan. Once the space is satisfied, a signal shall be sent to stop the exhaust fan and close the outside air damper.

3.08 Pool Dehumidification Unit (NDU)

A. The NDU shall operate as required by manufacturer's specification and be controlled by a microprocessor supplied with NDU equipment; sequence heating, cooling and dehumidification as called for by space thermostat and humidistat and system microprocessor.

B. Fresh Air system damper with timeclock control for occupied and unoccupied.

C. Flow switch shall be interlocked with pool recirculating pumps.

D. Duct heater shall operate in conjunction with the NDU Unit control sequence. Unit shall sequence heat on in multiple stages. Heater shall have overheat and airflow safety switches in addition to U.L., N.E.C. and Code requirements.

E. Interlock NDU with water heaters for staging.

F. Pool Exhaust fan runs continuously at 25% of rated maximum, and 100% during occupied hours (timeclock)

3.09 Combustion Air and Clothes Dryers Louver Dampers,

A. Interlock with gas fired equipment to open when equipment fires.

END OF SECTION

SECTION 231123 - NATURAL GAS PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, hangers, supports, and connections for natural gas piping systems.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and 01 - Specification Sections, apply to this Section.

B. Section 223000 – Plumbing Equipment

C. Section 230529 – Hangers and Supports for HVAC Piping and Equipment

D. Section 230553 – Identification for HVAC Piping and Equipment

E. Section 237313 – Packaged Outdoor Central-Station Air-Handling Units

1.03 REFERENCES

A. ANSI B36.10 – Carbon, Alloy and Stainless Steel Pipes; The American National Standards Institute.

B. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2003.

C. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2004 (ANSI/ASME B31.9).

1.04 DESCRIPTION OF WORK

A. Work under this section includes the furnishing of all equipment, piping, hangers, valves, unions, etc. to make the following systems complete and operating.
   1. Natural gas

B. Make connections to all equipment.

C. Provide all necessary gas pressure regulators.

D. Provide all necessary gas regulator vent piping.

1.05 SUBMITTALS

A. Comply with Division 00 and 01 – Submittal Procedures.

B. Project Record Documents: Record actual locations of all valves and note on drawings any deviations from the contract documents.

PART 2 - PRODUCTS

2.01 VALVES - NATURAL GAS

A. Isolation and shut-off
   1. Pipe sizes 4" and smaller, cast iron body, bronze or nickel plated cast iron eccentric plug, HYCAR plug seal, screwed ends, U.L. listed. Manufacturer: DeZurik 425 RS 49.
   2. Alternate valve. Bronze body ball valve, lever handle, solder or screwed ends, teflon seats and seal, 300 lb. WOG or minimum at 275 degrees F. Manufacturer: Apollo Series 80, Crane 2330 FT, Contromatics 11000-AA, Lunkenheimer 700 ST or 722 ST, Wochester 411T.

B. Gas Pressure Regulators
   1. Full lock-up with vent limiting device to limit the escape of gas from the vent opening in the event of diaphragm failure.
   2. Pressure regulators shall be sized to deliver the quantity of gas required by the equipment with an inlet pressure of 2 psi and an outlet pressure required by the equipment.

2.02 PIPE AND PIPE FITTINGS

A. Natural Gas
   1. Pipe - (Indoor)
      a. 2-1/2" and larger - Schedule 40 thickness black steel (ANSI B36.10)
      b. 2" and smaller - Schedule 40 thickness black steel (ANSI B36.10) or type K soft drawn copper.
   2. Fittings - (Indoor)
      a. 2-1/2" and larger - Black steel, schedule 40, welded.
      b. 2" and smaller - Black steel, screwed then welded or malleable iron to be used with schedule 40 black steel piping. Flare fittings to be used with type K soft drawn copper.
   3. Pipe - (Outside Above Ground)
      a. 2-1/2" and larger - Schedule 40 thickness black steel (ANSI B36.10), finish with rust inhibitive primer and paint.
      a. Schedule 40 thickness galvanized steel.
      b. 2" and smaller - Schedule 40 thickness black steel (ANSI B36.10), finish with rust inhibitive primer and paint.
      b. Schedule 40 thickness galvanized steel.
   4. Fittings (Outside Above Grade)
      a. 2-1/2" and larger - black steel, schedule 40, welded, primed and painted.
      a. 2-1/2" and larger - galvanized, screwed.
      b. 2" and smaller - Malleable iron, screwed, primed and painted
      b. 2" and smaller - Galvanized, screwed

2.03 PIPE SLEEVES

A. Floor sleeves shall be uncoated or galvanized steel pipe not less than Schedule 40.

B. Sleeves in rated walls shall be as required for U. L. listing.

C. Temporary sleeves in poured concrete walls or floors shall be poly-sleeve with nailing flange.

2.04 FLOOR, WALL AND CEILING ESCUTCHEON PLATES

A. Escutcheon plates shall be at least 1/32" thick and shall be equipped with set screws for locking around pipe. Plates shall be finished steel chromium plated.

PART 3 - EXECUTION

3.01 NATURAL GAS PIPING

A. Gas piping shall be installed with drip legs and unions at all regulators and equipment connections.

B. Maintain minimum 4" straight run between changes in direction.

C. Follow fuel gas piping manufacturer's installation instruction on joint preparation, adhesive application and curing.

D. Gas piping installed between appliance gas pressure regulators and the appliance shall not be more than 10'-0" in length and shall at a minimum be the same size as the appliance connection.

E. For gas pressure regulators that require venting, provide vent piping from the regulator and extend to the building exterior to an approved location.

3.02 PIPE SLEEVES

A. Provide sleeves for all piping as follows:
   1. Precast slabs.
   2. Exposed finished areas.
   3. Fire rated or acoustical walls.
   4. Exterior walls.
   5. CMU walls.

B. Sleeves shall be a minimum of 1” greater in inside diameter than piping or insulated piping passing through sleeve.

C. Fabricate all pipe sleeves of new material, cut square and reamed.

D. All sleeves through walls extend full thickness of wall, cut flush with finished surfaces.

E. Permanent sleeves for copper or steel piping through floor slabs for piping, shall extend 2" above finished floor. Sleeves shall extend 4" above the floor in mechanical room, laundry and/or kitchens. All sleeves shall be bonded to the slab with an epoxy bonding material.

F. Pack space between pipe and all sleeves.

G. In locating and setting sleeves, this Contractor is to leave a minimum of 4" between sleeves in rows or clusters.

3.03 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding
   7. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   8. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   9. Provide copper plated hangers and supports for copper piping.
   10. Supports shall be sized for weights and pipe sizes encountered.
   11. Supports shall properly compensate for all thermal expansion and contraction.

B. Floor, wall and ceiling escutcheon plates
   1. Where uncovered, exposed pipes pass through walls or floors, they shall be fitted with wall or floor plates.
   2. Plates shall be set tight against wall or floor. Plates on other than exposed pipes shall be prime coated.

C. Horizontal Hanger Spacing Schedule
   1. Steel Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
1/2" tube only	6'	1/4"
1/2" - 1"	8'	3/8"
1-1/4" - 1-1/2"	10'	3/8"
2"	10'	1/2"

   2. Copper Pipe

Pipe or Tube Size	Hanger Spacing	Minimum Rod Diameter
1/2"	4'	3/8"
¾”	6'	3/8"
1”	8'	3/8"

D. Roof Pipe Supports
   1. Remove loose aggregate from built-up or ballasted membrane roof area beneath pipe stand.
   2. Place traffic pad at pipe support location and locate pipe stand on pad.

3.04 VALVES

A. Shutoff valves shall be located in places so as to provide access for operation and shall be protected from damage.

B. Provide shut off valves on both the supply side and the discharge side of the gas meter.

C. Interior piping systems shall be provided with an approved main shutoff valve before the first branch line. The main shut off valve shall be installed in the first available location inside the building that provides ready access and shall have a permanently attached handle.

D. Exterior roof piping systems shall be provided with an approved main shutoff valve installed 10 feet or more from the roof edge and before the first branch line.

E. Each appliance shall be provided with a shutoff valve separate from the appliance. The shutoff valve shall be located in the same room as the appliance and shall not be further than 6 feet from the appliance.

F. Shutoff valves for decorative vented appliances, such as fireplaces, may be installed in an area remote from the appliance. Such valve shall be permanently labeled, shall serve no other equipment, and shall be readily accessible.

G. For piping systems serving multiple tenant buildings, each tenant shall have an individual valve to control the piping to the tenant space. This valve shall be readily accessible by the tenant.

H. For piping systems serving multiple tenant buildings, unless otherwise waived by the building official, a main shut off valve shall be located in a common unlocked utility room or similar space that provides ready access for all tenants.

I. Provide plug valves in natural gas systems for shut-off service.

3.05 SERVICE CONNECTIONS

A. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.06 IDENTIFICATION

A. All black steel gas piping shall be identified every 50 feet, on both sides of wall or floor penetration, and at every change of direction. Indicate the type of service and direction of flow.

B. All gas piping, not black steel, shall be labeled every 5’0” except in rooms where equipment is served.

C. All valves shall be tagged except for valves located within 5 ft. of equipment it serves and in a direct line of sight. A schedule shall be submitted to Architect/Engineer indicating location, rooms served and function.

D. All equipment furnished shall be labeled.

3.07 PIPING TEST

A. Piping shall be tested with air at 75 psig or 1-1/2 times operation pressure, whichever is greater. System shall hold pressure for four hours, soap test joints.

END OF SECTION

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Flexible ductwork.

C. Natatorium Dehumidification System ductwork.

D. Air Distribution duct leakage test.

1.02 RELATED DOCUMENTS

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

B. Section 230593 - Testing, Adjusting, and Balancing for HVAC.

C. Section 230713 - Duct Insulation:

D. Section 233300 - Air Duct Accessories.

E. Section 233700 - Air Outlets and Inlets.

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2004a.

B. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association; 2002.

C. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1985, First Edition.

D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.04 PERFORMANCE REQUIREMENTS

A. Provide all labor and materials to install complete and operational duct systems.

B. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

C. Make connections to equipment, louvers, diffusers, devices, etc. shown on the drawings.

D. Installed under this section but not furnished:

1. Motorized control dampers

2. Smoke damper/fire smoke dampers

1.05 SUBMITTALS

A. Comply with requirements of Division 1.

B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCTWORK - LOW AND MEDIUM PRESSURE – RECTANGULAR

A. Ventilating ductwork shall be galvanized sheet steel except where specified otherwise, ASTM Specification A-93-59T in gauges as follows, with all sheets over 17" in width being crossbroken.

REQUIRED GAUGES (RECTANGULAR DUCTS)			
Low Pressure (Duct Pressure to 1-1/2" S.P.			Medium Pressure (Duct Pressure 1-5/8" to 5-1/2")
Sizes Inches-Width	Iron U.S. Gauge	Aluminum B&S Gauge	Iron U.S. Gauge
4 thru 12	#26	#24 (.02)	#24
13 thru 30	#24	#22 (.025)	#22
31 thru 54	#22	#20 (.032)	#20
55 thru 84	#20	#18 (.040)	#18
85 thru 96	#18	#15 (.051)	#16

B. Ductwork that will be painted shall be made using “paint grip” galvanized steel. Oils shall not be used in the manufacturing process.

2.02 SHEET METAL WORK - CIRCULAR DUCT

A. All ductwork will be manufactured by the same firm to assure tight fit of all ductwork and components whether circular or rectangular.

B. Ductwork to be painted shall be made with “paint grip” galvanized steel. The forming process shall use a lubricant compatible with the paint to be applied.

C. Round duct shall be manufactured of galvanized steel meeting ASTM-A653 and A924.by the following methods and in the minimum gauges listed.

Diameter	Minimum Gauge	Method of Manufacture
3" thru 14"	26 Ga.	Spiral Lockseam
15" thru 26"	24 Ga.	Spiral Lockseam
27" thru 36"	22 Ga.	Spiral Lockseam
37" thru 50"	20 Ga.	Spiral Lockseam

The spiral duct shall have locked seams so made as to eliminate any leakage under the pressure for which this system has been designed.

D. Fittings and couplings shall be of the following minimum gauges:

Diameter	Gauge
3" thru 36"	20 Gauge
38" thru 50"	18 Gauge

E. All fittings are to have continuous welds along all seams. All divided flow fittings are to be manufactured as separate fittings, not as tap collars welded into spiral duct sections.

F. All 90 degree tees and 45 degree laterals (wyes) up to and including 12" diameter tap size shall have a radiused entrance into the tap, produced by machine or press forming. The entrance shall be free of weld build-up, burrs or irregularities.

G. Elbows in diameters 3" through 14" shall be two section stamped elbows. All other elbows shall be gored construction with all seams continuous-welded. Elbows shall be fabricated to a centerline radius of 1.5 times the cross-section diameter. All elbows, not die-stamped, shall be fabricated according to the following schedule:

Elbow Angle	Number of Gores
Less than 35 degrees	2
36 degrees over 71 degrees	3
Over 71 degrees	5

H. Where it is necessary to use 2-piece mitered elbows, they shall have turning vanes in accordance with the following schedule:

Diameter	Number of Vanes
3" thru 9"	2
10" thru 14"	3
15" thru 19"	4
20" thru 60"	5

I. The leading edge of all vanes in ducts over 20" diameter shall be hemmed with 1/2" fold-back. Turning vanes in ducts over 24" shall be reinforced by rods or sectional construction to limit unsupported length of 24". Vanes shall be minimum of 20 gauge.

2.03 COUPLINGS FOR ROUND DUCT

A. Pipe-to-pipe joints in diameters to 50" are by the use of sleeve couplings, reinforced by rolled beads.

B. Pipe-to-fitting joints in diameters to 50" are by slip-fit of projecting collar of the fitting into the pipe.

C. Insertion length of sleeve coupling and fitting collar is 2" for diameters through 9" and 4" for diameters 10" and up.

2.04 FLEXIBLE DUCTWORK - LOW PRESSURE

A. Flexible duct for connections, where shown to diffusers, to registers, or air bonnets shall be made with factory pre-insulated duct composed of a corrosion-resistant reinforcing wire helix permanently bonded and enclosed in Tedlar film, then covered with 1" thick 3/4 lb. density fiberglass insulation blanket sheathed in a vapor barrier laminated to glass mesh.

B. Ductwork must comply with latest NFPA Bulletin 90A and be tested as Class 1 Air duct material, UL Standard 181.

C. Engineering data shall be as follows:

1. C factor: 0.23 Btu/hr./sq. ft./degrees F at 75 degrees F
2. Vapor Barrier Permeance: 0.30 GR/24 hr./M sq./MN hq
   per ASTM Method E96, Procedure A

3. Temperature Range: 0 degrees F to 180 degrees F
4. UL Rated Velocity: 4000 cfm
5. Flame Spread: not over 25
6. Smoke Developed: not over 50.

D. Acceptable manufacturers:

1. Owens-Corning Fiberglass
2. Glass Flex type OC-41
3. Thermaflex type M-KE
4. Metalfax
5. Wiremold.

2.05 NATATORIUM DEHUMIDIFICATION DUCTWORK

A. Shall be 18 gauge, type 304, stainless steel. Exposed sections shall have number four (4) finish. Entire assembly welded watertight.

2.06 DUCTWORK FABRICATION

A. All ductwork shall have all longitudinal and transverse joints butted and sealed with 3M's or United Sheet Metal's mastic duct sealer products.

B. Crossbreaking. All rectangular ducts whose width is 18" or greater shall have sheet metal surfaces crossbroken. Crossbreaking is not required if the ducts are insulated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.

F. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

G. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

H. Duct Area. Where sound insulation is specified and/or shown for ducts, they shall be constructed so the sizes shown on the drawings are the dimensions inside the insulation.

I. A reduction in duct area because of the installation of sound insulation will not be permitted.

PART 3 EXECUTION

3.01 INSTALLATION

A. All ductwork shall conform accurately to the dimensions indicated on the drawings. All ducts shall be straight and smooth on the inside with neatly finished joints. Ductwork shall be installed in accordance with the recommendations of the latest edition of ASHRAE Guide and Data Book (Systems and Equipment) Air Duct Design. Gauge of metal and reinforcing shall be in accordance with their table.

B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

C. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction standards - Metal and Flexible.

D. Changes of Duct Locations. Ducts shall be installed substantially as indicated on the drawings. However, where conflicts occur with other trades, the Architect reserves the right to require the Contractor to make minor changes in duct locations without extra cost to the Owner.

E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

F. Duct take-off fittings. All take-offs from main trunk ducts shall be of the "divertor" type unless specifically shown otherwise

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

I. Use double nuts and lock washers on threaded rod supports.

J. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.02 DUCT HANGERS AND SUPPORTS

A. Ductwork shall be substantially supported with hangers to structure depending upon local conditions, placing supports according to recommendations of SMACNA along entire length of duct. Upper ends of hangers to be securely fastened to structure or masonry by means of expansion bolts. No wood plug driven in masonry will be permitted. Punching of holes in any way will not be allowed. No nails, wires or cotter pins shall be run through ducts. All necessary hangers, braces, tees, angles and supports will be provided and secured in a satisfactory manner.

B. Horizontal. All ductwork shall be securely anchored to the building construction in a manner to be free from vibration and swaying under all conditions of operation. Ducts 60" x 24" and larger shall be supported with trapeze hangers consisting of rods and angles. Hangers for ducts smaller than 60" x 24" shall be attached to the duct with a minimum of two (2) screws and shall have straps of the same material as the duct in accordance with the following table where; W = Width and D = Depth of the duct.

Galvanized and Stainless Steel Rectangular Duct Hangers Minimum Size

	10 ft Spacing		8 ft Spacing	
W + D	STRAP	ROD	STRAP	ROD
96" or Less	1" x 16 GA	3/8"	1" x 18 GA	3/8"
97" - 120"	1" x 16 GA	1/2"	1" x 16 GA	3/8"

Aluminum Rectangular Duct Hangers Minimum Size

	8 ft Spacing			
W + D	STRAP	ROD		
72" or Less	1" x 14 GA	3/8"		
71" - 98"	1" x 12 GA	3/8"		
99" - 120"	1" x 11 GA	1/2"		

Galvanized and Stainless Steel Round Duct Hangers Minimum Size

DUCT DIAMETER	MAXIMUM SPACING	STRAP	ROD	QTY.
Up to 24"	12'	1" x 20 GA	1/4"	1
25" - 36"	12'	1" x 18 GA	3/8"	1

Aluminum Round Duct Hangers Minimum Size

DUCT DIAMETER	MAXIMUM SPACING	STRAP	ROD	QTY.
3" - 26"	12'	1" x 14 GA	3/8"	1
27" - 50"	12'	1" x 14 GA	3/8"	1

C. Vertical. Where duct risers pass through floors, supporting angles shall be securely fastened to ducts with rivets or screws attached to the ducts with the angles supported on adjoining floor construction in an approved manner. Vertical ductwork shall be supported at each floor. Angles shall be of the same material as the adjacent duct.

Duct Size	Angle Dimensions
36" x 18"	1-1/2" x 1-1/2" x 1/8"
48" x 24"	2" x 2" x 1/8"
60" x 30"	2" x 2" x 3/16"
60" x 60"	2" x 2" x 1/4"

3.03 INSTALLATION OF FLEXIBLE DUCTWORK

A. Ductwork shall be installed with spin-on fittings with integral volume damper for connection to branch duct. Connection to terminal supply device shall be through a coupler specifically designed to lock into device employed. Flexible insulations shall be attached to rigid duct and/or couplers with coupler clamp.

B. Installed lengths of flexible ductwork shall be limited to 5'-0" maximum lengths. When longer distances between terminals and branch ducts are encountered, the balance shall be made up of rigid sheet metal sections of construction hereinbefore specified.

3.04 DRAWINGS

A. In general the drawings of the Mechanical Systems and equipment are to scale, however, to determine exact locations of walls and partitions the Contractors shall consult the Architectural and/or Structural drawings which are dimensioned. Drawings shall not take precedence over field measurements.

B. Drawings of piping and ductwork although shown on scale drawings are diagrammatic only. They are intended to indicate size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction. If it is found, before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the drawings, the Architect or Engineer may require any or all contractors to change the location or arrangement of their work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect or Engineer.

C. Where discrepancies are discovered after certain portions or phases of any contract have been installed, the Architect or Engineer reserves the right to require any or all Contractors to make minor changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflicts with other work at no additional cost to the Owner.

D. Because the drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. Contractors shall furnish all incidental labor, material or equipment for the systems in their control so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the specifications.

3.05 DUCT SLEEVES AND CURBS

A. Provide sleeves for all duct penetrations through floors and walls.

B. Internal dimension of duct sleeve shall be large enough to encompass duct with insulation and packing material.

C. Comply with Division 03.

D. Provide curbs around entire duct assembly penetrating floors in mechanical penthouse.

1. Curb shall surround entire duct assembly.
2. Curb shall be integrated with floor and extend 3-1/2" above floor.
3. Curb shall be 3-1/2" thick.
4. Both sleeve and curb shall be required.

3.06 AIR DISTRIBUTION DUCT LEAKAGE TEST

A. This Contractor shall perform testing to insure tightness and construction of ducts and equipment. Leakage tests shall continue with progress of sheet metal installation.

1. Supply duct shall be considered that portion of the supply air distribution ductwork extending from the AHU fan outlets to and including the Air Valves and VAV terminal units.
2. Return air ductwork shall be considered that portion of the return air distribution ductwork extending from the return grille or register to the connection at the AHU fan casing.
3. Ductwork shall be tested regardless of its pressure classification. Refer to fan schedule on drawings and test ductwork for 1-1/2 times the listed system pressures.

B. Duct testing procedure shall conform to the Minnesota Energy Code which references SMACNA Duct Leakage Test Procedure – 1985 in the HVAC Air Duct Leakage Test Manual.

C. This Contractor shall provide all test equipment that should include the following:

1. Air source of high pressure air.
   a. Rotary type blower fan.
2. Device to measure total air flow accurately.
   a. Calibrated orifice plate.
   b. Air straightening vanes.
   c. Pressure tap and receptacle tube and dampering section.
3. Instruments
   a. Magnehelic gauge.
   b. U-tub monometer.
   c. Incline gauge.
4. These items shall be assembled on a portable device.

D. Field Test Procedures

1. Seal all openings in duct section to be tested.
2. Connect test apparatus to test section of duct.
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. Build up pressure in duct test section to 1-1/2 times the maximum operating pressure listed in the fan schedule on the drawings.
6. Read indicated pressure on instrument that is connected to section of duct under test.
7. Maintain this pressure for ten minutes which will indicate audible leaks.
8. Reduce pressure to operating pressure and make survey. Repair all visual and audible leaks. Shut down blower and release pressure when making repairs.
9. Upon completion of repairs, build up pressure to design operating pressure, and read leakage pressure on instrument connected across test apparatus orifice plate.
10. Leakage CFM is read by consulting a calibrated chart. If no leakage exists, zero pressure differential will be indicated.

E. Test Verification

1. The Sheet Metal Contractor shall engage the services of an independent air balancing test agency to verify test results and submit a certification certificate attesting to the results obtained. Arrangements shall be made between contractor and agency to coordinate the field test of installed sections of ductwork. Test results and verification shall be recorded and submitted on standard test forms.
2. Tested sections of ductwork shall be visually marked by agency with certification sticker and initial of field test inspector. Tests shall be made before duct sections are concealed.

END OF SECTION

SECTION 23 31 14
KITCHEN HOOD DUCTS

PART 1- GENERAL

1.1 SUMMARY

Listed, double and single wall, prefabricated, modular, grease duct for use with commercial cooking equipment for removal of grease and smoke laden vapors from kitchen hoods in a fire resistant or not application (as described in NFPA 96), at a maximum temperature of 500°F under continuous operation.

1.2 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references.

C. Comply with applicable UL safety standards; provide products which have been UL listed and labeled appropriate to the application, manufacturer's instructions and local requirements:
   1) UL1978 – "Standard for Grease Ducts"
   2) UL 1978 and UL 2221 – "Standard for Grease Duct and Fire Resistive Grease Duct Enclosure Assemblies"

D. National Fire Protection Association (NFPA):
   a. Comply with NFPA 96 – "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations"

E. International Code Congress (ICC)
   a. Comply with "International Mechanical Code" and "International Building Code" (if applicable to the project / site)

F. International Association of Plumbing and Mechanical Officials (IAPMO)
   a. Comply with "Uniform Mechanical Code" (if applicable to the project / site)

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain listed system components through one source from a single manufacturer.

B. Must install duct in accordance with terms of NFPA 96, local code and manufacturer's installation instructions.

1.4 WARRANTY

A. Listed grease duct shall have a limited lifetime warranty to begin at the date of installation.

PART 2- PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of Authorities Having Jurisdiction.

2.2 AVAILABLE MANUFACTURERS

A. Listed and Classified Single-Wall and Double-Wall insulated grease duct shall be manufactured by DuraVent or approved equal.

2.3 LISTED GREASE DUCT

A. The grease duct shall be insulated, double-wall or single-wall factory-built type for use with Type 1 kitchen hoods, as described in NFPA 96 for the transportation of air and grease-laden vapors from commercial cooking operations.

B. Clearance to Combustible – Product shall meet Clearance to Combustible requirements as per UL Listing – (Table 1).

C. Product Description:

1. Single or Double Wall product appropriate to Clearance to Combustible and local requirements.
2. All section joints shall incorporate a self-centering feature to ensure proper alignment of mating flanges and proper spacing between the inner wall (flue) and the outer wall (casing).
3. The inner wall (flue) shall be laser or plasma welded.
4. System shall be rated for continuous operation at 500° F and intermittent operation at 2000° F.
5. All components of the grease duct system shall be provided by the manufacturer to ensure the system meets the requirements of the listing including duct supports, guides, fittings, cleanouts, and expansion joints required to install the duct.
6. System shall be designed to provide access for inspection and cleaning of each change of duct direction, permit drainage of grease residue through a duct section and enable the system to allow various types of fire suppression equipment to be installed into the grease ductwork. All code required doors and tee caps are to be accessible without the use of any tools or instruments.

Grease Duct Application:

TABLE 1 - GREASE DUCT UL-1978 and UL-2221 (DIS3Z only) Clearances to Combustible (Unenclosed Surrouding)

Minimum Air Space Clearances to Combustible material and Building insulation for 500°F (260°C) continuous temperature grease duct system.

Duct Model	Flue Diameter Ø (in)	Clearance to Combustible (in)	Clearance to Non-Combustible (in)
DCL	Ø5 to Ø36	18	0
DAS1	Ø5	4	0
	Ø6 to Ø11	5	0
	Ø12 & Ø16	6	0
	Ø18 & Ø22	7	0
	Ø24 & Ø28	8	0
	Ø30 & Ø34	9	0
	Ø36	10	0
DIS1	Ø5 to Ø13	2	0
	Ø14 to Ø24	3	0
	Ø26 to Ø34	4	0
	Ø36	5	0
DIS2 and DIS4	Ø5 to Ø16	1	0
	Ø18 to Ø30	2	0
	Ø32 to Ø36	3	0
DIS3Z (UL-2221)	Ø5 to Ø36	0	0

Dimensions are in inches

D. Grease duct shall be certified to applicable listings:

1) UL 1978 – "Standard for Grease Ducts"
2) UL 1978 and UL 2221 – "Standard for Grease Duct and Fire Resistive Grease Duct Enclosure Assemblies"

E. Duct Construction: shall be constructed of an inner wall and an outer wall with 1" air insulation, 1", 2", 3", or 4" AES fiber blanket insulation between the walls.

a. The inner wall shall be constructed of 0.035-inch-thick Types 304 or 316 stainless steel.
b. The outer wall shall be constructed of Types 304, stainless steel or Galvalume.

F. No leak factory welds

G. Galvalume Outerwall

H. Lifetime Warranty

PART 3- EXECUTION

3.1 INSTALLATION OF FACTORY BUILT GREASE DUCT

A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 96, whichever is most stringent.

B. The installation shall be in accordance with the manufacturer's installation instructions and shall conform to all applicable state and local codes.

C. Inner pipe joints shall be held together by means of formed 'V' bands and sealed with S650 Sealant.

D. Connection to the hood shall be made with a round hood collar or a square-to-round transition.

E. Curb mounted fans shall incorporate a fan adaptor plate.

F. All construction and supporting of the kitchen ventilation system will be in accordance with DuraVent installation instructions.

G. Store grease duct sections inside or covered adequately to protect from weather or accidental damage.

H. The entire grease duct system from the appliance to the termination, including all accessories, except as noted, shall be from one manufacturer.

I. Grease Duct Test – Prior to use or concealment of any portion of the grease duct system, a leakage test shall be performed. Ducts shall be considered to be concealed where installed in shafts or covered coating or wraps that prevent the ductwork from being inspected on all sides. The permit holder shall be responsible to provide the necessary equipment and perform the grease duct leakage test. The grease duct shall be tested by either of two methods.
   a. Water Testing – as described in ASHRAE 154, 2016 edition Section 5.2 1.2 be the method of execution for performing these tests.
   b. Pressure Test – tested by drawing a vacuum on or pressuring the installed, in place, grease duct to a minimum of 4 inches water column (995 pa. 0.144 psi). The test shall be witnessed by an authorized inspector. The grease duct will pass inspection if the pressure or vacuum applied holds for 15 minutes with zero leakage. The measurement range of the test gauge or manometer used shall be from 0 to no more than 10 inches WC.

J. All design and installation documents must contain proper placement and configuration of Access doors that meet code, manufacturer's recommendations and local requirements. Ensure Access Doors are installed and to code. Site-built Access doors must be inspected at each stage of installation process to ensure they are installed to code and at the end of the process not covered in insulation.

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Combination fire and smoke dampers.

C. Duct access doors.

D. Flexible duct connections.

E. Volume control dampers.

F. Motorized dampers.

1.02 RELATED DOCUMENTS

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

B. Section 230548 - Vibration Controls for HVAC Piping and Equipment.

C. Section 230913 – Instrumentation and Control Devices for HVAC Controls: Control damper operators.

D. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCES

A. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association; 2002.

B. NFPA 92A - Standard on Smoke-Control Systems; National Fire Protection Association; 2006.

C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

D. UL 33 - Heat Responsive Links for Fire-Protection Service; Underwriters Laboratories Inc.; 2003.

E. UL 555 - Standard for Fire Dampers; Underwriters Laboratories Inc.; 2006.

F. UL 555S - Standard for Leakage Rated Dampers for Use in Smoke Control Systems; Underwriters Laboratories Inc.; 1999.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from soiling and damage to frames, operating linkages, blades, and accessories.

PART 2 PRODUCTS

2.01 AIR TURNING VANES

A. Turning vanes shall be well braced and rough or raw edges shall be avoided to prevent objectionable noise; they shall be the double thickness type and shall be the same gauge as the duct in which they are installed. Vanes shall be preassembled on runners before being installed in the elbow. Vanes shall conform to the following table:

Duct Width Inches	Vane Spacing Inches	Inside Blade Radius Inches	Outside Blade Radius Inches	Runner Width Inches
Up to 25	1-1/2 centers	2	1	2-1/4
Above 25	3-1/4 centers	4-1/2	2-1/4	4-1/2

B. Acceptable Manufacturers:
1. Ductmate
2. Sheet Metal Connectors Inc.
3. Aero Dyne
4. Approved equal

2.02 COMBINATION FIRE AND SMOKE DAMPERS

A. Performance: 1-1/2 hour rated UL Standard 555 S, Class II

B. Frame: 16 gauge galvanized steel.

C. Blade type: Triple vee construction, 6" wide, galvanized steel.

D. Linkage: Parallel blade.

E. Bearings: Stainless steel or bronze oilite pressed into frame.

F. Fusible Link: 165 degrees F.

G. Position Switch: One switch to prove the damper is open, a second switch to prove damper is closed.

H. Electric Damper Motor
1. Two position, spring return.
2. 60 lb.-in. torque.

3. Internal limit switch to de-energize motor when damper is in open position.
4. Non-stall type motor.
5. Electric brake coil to hold damper motor in open position. Unit power consumption shall be 10W in the open position.
6. Damper linkage and mounting hardware.
7. U. L. Listed.
8. Auxiliary SPST switch mounted within enclosure.
9. Manufacturer: Honeywell ML Series with auxiliary spst switch (120V, 208V, 240V).

I. Acceptable Manufacturers:
1. Ruskin FSD36
2. PREFCO 5020 (Class II Option)
3. Ruskin FSDR25
4. Greenheck FSD 22
5. Cesco FSD2B.

2.03 DUCT ACCESS DOORS

A. Where motorized dampers, fire dampers, control equipment, etc. are installed in ducts, provide access panels made airtight with gasketed edges. Use sponge rubber or felt gasketing material. The panels shall be attached to the duct with cam latches. The access panels shall be of adequate size to permit maintenance of the equipment.

B. Acceptable Manufacturers:
1. Cesco
2. Nailor Industries, Inc.
3. Ruskin Company

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq. yd.
a. Net Fabric Width: Approximately 2 inches wide.
2. Metal: 3 inches wide, 24 gauge thick galvanized steel.

2.06 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards

B. This Contractor shall furnish and install the required air devices necessary to produce the specified air volume without excess air resistance or noise. Butterfly or splitter dampers shall be installed at all branch take-off locations so that the air volume can be adjusted in both the branch and trunk duct. Dampers shall be reinforced to prevent vibration and shall be equipped with approved damper rods, quadrants and locking devices. Quadrants shall be marked to indicate damper position. Where ducts are insulated, quadrants shall be set to finish flush with insulation. Volume dampers in ductwork located above in accessible sheet rock ceilings shall be provided with concealed type regulators mounted in ceiling with flush chrome plated cover.

Damper material shall be the same as adjacent ductwork. Volume dampers located above gypsum board ceilings shall have extended shafts to operate straight or 90 degree angle drive sets from a concealed style regulator set with hex nut. DuroDyne Model Nos. SRC-140, SRC-380, SRC-120.

C. Additional dampers may be required and shall be provided by this Contractor in ducts to balance air system. They shall be of the louver type, opposed blade with 6" maximum width, indicated damper position, channel welded frames and iolite brass bearings.

D. Branch take-off sizes on drawings shall be strictly adhered to and if deviations are necessary due to construction conditions, the Architect/Engineer shall be contracted before installation is made.

E. Acceptable Manufacturers:
   1. Cesco
   2. Nailor Industries, Inc.
   3. Ruskin Company
   4. Greenheck
   5. Safe Air

2.07 VERY LOW LEAK DAMPERS

A. Performance: Test in accordance with AMCA 500-D.

B. Frames: Extruded aluminum not less than .080" thick, 4" deep insulated with polystyrofoam. Flanged in duct type.

C. Blades: Extruded aluminum, maximum blade size 6 inches wide. Extruded aluminum internally insulated, thermally broken.

D. Linkage: Parallel or opposed blade.

E. Bearings: Compared of a Celcan inner bearing fixed to a 7/16" aluminum blade pin, rotating within a polycarbonate outer bearing inserted in the frame.

F. Blade gaskets and frame seal shall be silicone.

G. Leakage: Less than 3 CFM/square foot at 1" w.g.

H. Acceptable Manufacturers:
   1. Tampco Series 9000 SC

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 3100 for duct construction and pressure class.

B. Provide motorized dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Kitchen hood exhaust ductwork –provide grease tight access panels installed ten feet on center and in each change of direction for purpose of cleaning.

E. Provide combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.

G. Demonstrate resetting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct takeoff. Additional damper may be required and shall be provided by this Contractor in ducts to balance air system. Branch take-off sizes on drawings shall be strictly adhered to and if deviations are necessary due to construction conditions, the Architect/Engineer shall be contracted before installation is made.

K. Use splitter dampers only where indicated.

L. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 233413 - HVAC FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Centrifugal fans.

B. Inline centrifugal fans.

C. Fan accessories.

1.02 RELATED DOCUMENTS

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

B. Section 230513 - Electrical Motor Requirements for HVAC Equipment.

C. Section 230913 - Instrumentation and Control Devices for HVAC.

D. Section 230548 - Vibration Controls for HVAC Piping and Equipment.

E. Section 230713 - Duct Insulation.

F. Section 233300 - Air Duct Accessories.

1.03 REFERENCES

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (R2000).

B. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2003.

C. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 1999 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

D. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/licenses/search.aspx.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2005.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2005.

G. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.04 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing 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. Temperature Limit: Maximum 300 degrees F.

E. Static and Dynamic Balance: Eliminate vibration or noise transmission to occupied areas.

1.05 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

D. Manufacturer's Instructions: Include complete installation instructions.

E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.06 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Protect motors, shafts, and bearings from weather and construction dust.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

PART 2 PRODUCTS

2.01 CENTRIFUGAL FANS

A. Housing and Frame
   1. Continuously welded steel.
   2. Braced with welded steel members to prevent vibration.
   3. Inlet cone with inlet collar.
   4. Discharge collar.
   5. Primed and coated with baked enamel.

B. Drive
   1. Polished solid-steel shaft.
   2. Welded steel bearing supports.
   3. Heavy duty grease lubricated ball or roller pillow block bearings with 200,000 hour life.
   4. Extended lube lines.
   5. Fixed pitched sheaves – Fans with variable frequency drive - Variable pitch sheaves – constant volume fans

C. Fan
   1. Single width, single inlet
   2. Class I or II.
   3. Statically and dynamically balanced.
   4. Belt guard (if belt drive is required).
   5. AMCA rated and certified.

D. Motor
   1. Grease lubricated bearings.
   2. Open drip proof construction.

E. Miscellaneous
   1. Fan inlet screen.
   2. Fan housing access door.
   3. Vented weather cover to meet UL 705.
   4. AMCA Type A spark-proof construction with all parts in airstream fabricated from aluminum.

F. Acceptable Manufacturers:
   1. Penn Barry
   2. Cook
   3. Greenheck
   4. Twin City Fan
   5. Peerless

2.02 INLINE FANS - CENTRIFUGAL

A. Inline fans shall be direct or belt driven as scheduled. Provide belt guard on belt driven equipment. The square shaped fan housing shall be of heavy gauge formed steel. One of the sides shall be accessible to the entire drive assembly and wheel allowing for cleaning, inspection or service. The motor shall be mounted on the hinged side exterior isolated from the airstream. The belt and pillow block ball bearings shall be protected from the airstream by an enclosure. The shafts shall be keyed to both the wheel and pulley. The fan inlet shall be a spun venturi throat overlapped by a backward curved centrifugal wheel and spun cone for maximum performance. Fan shall be AMCA Certified. Factory mounted and wired disconnect switch.

B. Provide extended lube lines for all fittings.

C. Acceptable Manufacturers:
   1. Greenheck
   2. Peerless
   3. Acme
   4. Twin City Fan
   5. Penn Barry
   6. Carnes
   7. Jenn Air
   8. Cook

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads. Refer to Section 220548.

C. All fans shall have proper belt guards.

D. Furnish all support beams, angles, stands, etc. to install equipment specified in this section.

E. Provide vibration isolation as specified in Section 230548.

F. Install flexible connections between fan inlet and discharge to ductwork; refer to Section 233300. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

G. Provide sheaves required for final air balance.

END OF SECTION

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers

1.02 RELATED DOCUMENTS

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

1.03 REFERENCES

A. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association

1.04 SUBMITTALS

A. Comply with requirements of Division 1.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 GRILLES, REGISTERS, DIFFUSERS AND AIR CONTROL DEVICES

A. Diffusers other than stainless steel shall be prime coated and finished with baked-on white enamel finish. Grilles and registers shall be aluminum or steel prime coated and finished with baked-on white enamel finish. The various grilles, registers and diffusers are indicated on the drawings by alphabetical letters according to the schedule on drawings.

B. This Contractor shall determine frame styles by referring to the Architectural Drawings. Where ceilings are exposed grid lay-in type, frame styles shall be lay-in type.

C. Acceptable Manufacturers:
1. Tuttle & Bailey
2. Titus
3. Carnes
4. Anemostat

2.02 LOUVERS

A. General. Stationary, 4 inch, aluminum with drainable blade.

B. Frame: Extruded aluminum, .081 inch wall thickness or greater, caulking slots.

C. Blades: Extruded aluminum, .125 inch wall thickness, 37-1/2 degrees on 5-29/32 inch centers with drain gutter in each blade.

D. Screen: Aluminum 3/4" x 3/4"

E. Finish: shop-painted custom color, baked enamel.

F. Sill: Extended front sill.

G. Performance (based on 48" x 48") AMCA certified.
   1. Free area - 57% or greater
   2. Max velocity thru free area - 1000 fpm
   3. Pressure drop at max velocity - .10 in w.g.
   4. Water penetration at max velocity - .01 oz. per sq. ft. free area, 15 min.

H. Acceptable Manufacturers
   1. Ruskin ELF6375DX
   2. Approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

3.02 LOUVER

A. Coordinate with architectural drawings for exact dimensions.

B. Blank off with 2” insulated double wall housing all unused portions of louver.

C. Provide Architect with color selection chart for final color selection.

END OF SECTION

SECTION 234000 - HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disposable panel filters.

1.02 RELATED DOCUMENTS

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

B. Section 230519 – Meters and Gauges for HVAC

C. Section 237313 – Modular Indoor Central-Station Air-Handling Units

1.03 REFERENCES

A. ARI 850 - Commercial and Industrial Air Filter Equipment; Air-Conditioning and Refrigeration Institute; 2004.

B. UL 900 - Standard for Air Filter Units; Underwriters Laboratories Inc.; 2004.

1.04 PERFORMANCE REQUIREMENTS

A. Conform to ARI 850 Section 7.4.
   1. Dust Spot Efficiency: Plus or minus 5 percent.

PART 2 PRODUCTS

2.01 2 INCH 30% EFFICIENCY

A. Air filters shall be 2" thick MERV 8, pleated, disposable type. Each filter shall consist of a non-woven cotton fabric media, media support grid and enclosing frame. The filter shall be listed by Underwriters' Laboratories as Class II.

B. The effective filter media shall be not less than 4.6 square feet of media per 1.0 square foot of filter face area. Initial resistance at 500 fpm approach velocity shall not exceed .40" WG.

C. The media support shall be a welded wire grid with an effective open area of not less than 96%. The welded wire grid shall be bonded to the filter media to eliminate the possibility of media oscillation and media pull away. The media support grid shall be formed in such a manner that it affects pleat design, allowing total use of filter media.

2.02 FILTER MANUFACTURERS

A. American Air Filter

B. Camfil Farr Company

C. Tri-Dim Filter Company

PART 3 EXECUTION

3.01 INSTALLATION

A. Install air cleaning devices on all fan-coil and supply air systems in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION

SECTION 23 74 33 - DEDICATED OUTDOOR AIR UNITS

Part 1 - General

1.02 General Description

A. This section includes the design, controls and installation requirements for packaged rooftop dedicated outdoor air units ("DOAS").

1.03 Quality Assurance

A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.

B. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

C. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

D. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.

E. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

F. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

G. Unit shall be approved for use in and outside High Velocity Hurricane Zones (HVHZ) by the Florida Building Code (FL# 15031), when using the required steel rooftop curb and attachment methods. Maximum allowable lateral wind pressure is +100psf/-100psf. Maximum allowable uplift is +50psf/-50psf. Positive and negative required design pressures calculated for use with this system shall be determined by others on a job specific basis, in accordance with the governing code. Site specific pressures shall be less than or equal to the listed positive or negative allowable lateral wind design pressure and allowable uplift values for the product.

1.04 Submittals

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.05 Delivery, Storage, and Handling

A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation, and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

1.06 Warranty

A. Manufacturer shall provide a limited "parts only" warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for Installation, Operation,

and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and filters.

Part 2 - Products

2.01 Manufacturer

A. Products shall be provided by the following manufacturers:
   1. AAON
   2. Substitute equipment may be considered for approval that includes at a minimum:
      a. R-410A refrigerant
      b. Direct drive supply fans
      c. Double wall cabinet construction
      d. Insulation with a minimum R-value of 13
      e. Stainless steel drain pans

2.02 Rooftop Units

A. General Description
   1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, reheat coil, gas heaters, and unit controls.
   2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
   3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
   4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.
   5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
   6. Installation, Operation, and Maintenance manual shall be supplied within the unit.
   7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
   8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.

B. Construction
   1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
   2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
   3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
   4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
   5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
   6. Access to filters, dampers, cooling coils, reheat coil, heaters, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
   7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
   8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.

9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
10. Unit shall include lifting lugs on the top of the unit.

C. Electrical

1. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
2. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.
3. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

E. Cooling Coils

1. Evaporator Coils
   a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
   b. Coils shall have interlaced circuitry and shall be standard capacity.
   c. Coils shall be hydrogen or helium leak tested.
   d. Coils shall be furnished with factory installed expansion valves.

F. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.
2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.
4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
7. Unit shall include 2 stages of capacity control.
8. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
9. All refrigeration circuits shall be provided with factory installed hot gas bypass to protect against evaporator frosting and to prevent excessive compressor cycling.

G. Condensers

1. Air-Cooled Condenser
   a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.
   b. Coils shall be designed for use with R-410A refrigerant. Coils shall be multi-pass and fabricated from aluminum microchannel tubes.
   c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
   d. Coils shall be hydrogen or helium leak tested.

e. Condenser fans shall be high efficiency electrically commutated motor driven with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

H. Gas Heating

1. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.
2. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.
3. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
4. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.
5. Natural gas furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature setpoint shall be adjustable on the electronic controller within the controls compartment. 195 MBH gas heating assembly; 10:1 turndown.

I. Filters

1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.
2. Unit shall include 100% motor operated outside air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge and end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511.Damper assembly shall be controlled by spring return, 2 position actuator. Unit shall include outside air opening bird screen and outside air hood.

J. Controls

1. Factory Installed and Factory Provided Controller
   a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
   b. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
   c. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
   d. Makeup Air Controller
      1. Unit shall modulate cooling with constant airflow to meet ventilation outside air loads. Cooling capacity shall modulate based on supply air temperature.
      2. Hot gas bypass shall be required on the lead refrigeration circuits of systems without variable capacity compressors.
      3. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet outside air humidity loads and prevent supply air temperature swings and overcooling of the space.
      4. Unit shall modulate heating with constant airflow to meet ventilation outside air loads. Heating capacity shall modulate based on supply air temperature.
   e. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit.

Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network. [WattMaster Orion Controls System]

K. Accessories

1. Unit shall be provided with a smoke detector sensing the supply air of the unit, wired to shut off the unit's control circuit.
2. Unit shall be provided with a safety shutdown terminal block for field installation of a smoke detector which shuts off the unit's control circuit.

2.03 Curbs

A. Curbs shall be fully gasketed between the curb top and unit bottom with the curb providing full perimeter support, cross structure support and air seal for the unit. Curb gasket shall be furnished within the control compartment of the rooftop unit to be mounted on the curb immediately before mounting of the rooftop unit.

B. Knockdown curb (with duct support rails) shall be factory furnished for field assembly.

C. Solid bottom curb shall be factory assembled and fully lined with 1 inch neoprene coated fiberglass insulation and include a wood nailer strip. (Curb shall be adjustable up to 3/4 inch per foot to allow for sloped roof applications.)

Part 3 - Execution

3.01 Installation, Operation, and Maintenance

A. Installation, Operation, and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation, and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

Part 4 – DOAS Schedule

Supply CFM	3800
Outside CFM	3800
ESP (in wg)	1.5
Total Cap (MBH)	265
Sen Cap (MBH)	119
OADB	85.4
OAWB	76.6
Unit LADB	75
Unit LAWB	62.6
%RH	50
SA Fan HP	3
Heat Type	Nat. Gas
Heat EADB	7
Heat LADB	86.9
Heat Input (MBH)	405
Heat Output (MBH)	328.1
Voltage	208/3/60
Unit FLA	85
MCA	92
MOP	1120
Op Weight (lbs)	2757
Model String	AAON RN

Remarks:

(1) Summer Design Conditions based on ASHRAE .4% Evaporation Column
(2) Unit to have modulating hot gas re-heat for dehumidification (on/off not acceptable) and deliver 75 F @ 50% RH air at design conditions
(3) Unit to have hot gas bypass on ALL circuits
(4) Unit to have modulating gas heat furnaces with stainless Steel HX carrying 25 year non-pro-rated warranty; 10:1 turndown
(5) Cabinet construction is 2" double wall with foam injected panels with R-13 insulation value
(6) 2500 Salt Spray Tested exterior paint
(7) Outside air metal mesh pre-filter; 2" pleated filters - MERV 8
(8) Factory installed electrical disconnect for single point wiring
(9) ECM Condenser fan motors for condenser head pressure control (VFD Condenser Fans acceptable)
(10) Units to have condenser coil hail guards
(11) Direct Drive Plenum Supply Fan with unit mounted VFD (belt driven fans not acceptable)
(12) Phase and brownout protection monitor
(13) 14" High Fully welded insulated plenum curb for horizontal discharge
(14) Units shall include factory start-up and two (2) year parts and labor warranty for the entire unit, including refrigerant. Compressor warranty will extend an additional three (3) years - parts only.
(15) Call Tom Whiteley with HAVTECH - 443-534-7716 or email tomwhiteley@havtech.com for all pricing

END OF SECTION

Unit Rating

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094
AAONEcat32 Ver. 4.288 (SN: 5555616-)

1A	1B	1C	1D	2	3	4	5A	5B	5C	6A	6B	6C	7	8	9	10	11	12	13	14A	14B	15	16	17	18	19	20	21	22	23
R	N	-	0	2	0	-	8	-	0	-	B	B	0	2	-	3	8	B	:	M	0	0	0	-	U	0	B	-	D	Q	Q
-	B	0	0	-	0	J	E	B	L	B	F	-	0	0	-	0	0	0	0	0	0	V	B								

Tag: DOAS-1

Job Information

Job Name:	*Courtyard - Woodbury, NY*
Job Number:	*Job #2018020840*
Site Altitude:	*0 ft*
Refrigerant	*R-410A*

Unit Information

Approx. Op./Ship Weights:	*2757 / 2757 lbs. (±5%)*
Supply CFM/ESP:	*3800 / 1.5 in. wg.*
Final Filter FV / Qty:	*182.40 fpm / 6*
Outside CFM:	*3800*
Ambient Temperature:	*85.4 ºF DB / 76.6 ºF WB*

Static Pressure

External:	*1.50 in. wg.*
Evaporator:	*0.18 in. wg.*
Filters Clean:	*0.07 in. wg.*
Dirt Allowance	*0.35 in. wg.*

Economizer:	*0.00 in. wg.*
Heating:	*0.09 in. wg.*
Cabinet:	*0.02 in. wg.*
Re-Heat Coil:	*0.02 in. wg.*
Total:	*2.22 in. wg.*

Cooling Section

	Gross	Net
Total Capacity:	*264.95*	*259.34 MBH*
Sensible Capacity:	*118.85*	*113.23 MBH*
Latent Capacity:	*146.11 MBH*	
Mixed Air Temp:	*85.40 ºF DB*	*76.60 ºF WB*
Entering Air Temp:	*85.40 ºF DB*	*76.60 ºF WB*
Lv Air Temp (Coil):	*55.43 ºF DB*	*55.32 ºF WB*
Lv Air Temp (Unit)	*56.78 ºF DB*	*55.86 ºF WB*
Supply Air Fan:	*1 x 270D60 @ 1.95 BHP*	
SA Fan RPM / Width:	*1026 / 3.643"*	
Evaporator Coil:	*19.9 ft² / 6 Rows / 12 FPI*	
Evaporator Face Velocity:	*191.3 fpm*	

Heating Section

PreHeat Type:	*Std (No Preheat)*
Heating Type:	*Nat. Gas Heat*
Heating CFM:	*3800*
Total Capacity:	*328.1 MBH*
OA Temp:	*7.0 ºF DB / 6.0 ºF WB*
RA Temp:	*70.0 ºF DB / 53.0 ºF WB*
Entering Air Temp:	*7.0 ºF DB / 6.0 ºF WB*
Leaving Air Temp:	*86.9 ºF DB / 52.9 ºF WB*
Input:	*405.0 MBH*
Heater Qty:	*1*
Consumption:	*405.0 MBH*
Total Turndown Ratio:	*13:1*

Re-Heat Coil:

Capacity:	*80 MBH*
LA DB / WB:	*75.00 ºF / 62.60 ºF*
RH:	*50%*

Rating Information

Cooling Capacity (MBH):	*238.0*
Cooling EER:	*12.2*
Cooling IEER:	*14.1*

Rated in accordance with AHRI 340/360

Application EER @ Op. Conditions: *14.2*

Electrical Data

Rating:	*208/3/60*	Minimum Circuit Amp:	*92*
Unit FLA:	*85*	Maximum Overcurrent:	*110*

	Qty	HP	VAC	Phase	RPM	FLA	RLA
Compressor 1:	2		208	3			30.1
Condenser Fans:	2	1.00	208	1	1110	7.0	
Supply Fan:	1	3.00	208	3	1170	10.6	
Combustion:	2	0.25	208	1	3210	1.7	

Cabinet Sound Power Levels*

Octave Bands:	63	125	250	500	1000	2000	4000	8000
Discharge LW(dB):	85	85	85	83	79	82	80	76
Return LW(dB):	72	69	67	62	63	61	57	50

**Sound power levels are given for informational purposes only. The sound levels are not guaranteed.*

27.0" STAR Plenum

2425 South Yukon Ave - Tulsa, Oklahoma 74107-2728 - Ph. (918) 583-2266 Fax (918) 583-6094
AAONEcat32 Ver. 4.288 (SN: 5555616-)

JOB INFORMATION:

Job Name:	*Courtyard - Woodbury, NY*
Job Tag:	*DOAS-1*
Rep Firm:	*180*
Date:	*03/02/2020*

WHEEL SPECIFICATION:

Max RPM:	*1,800*
Diameter x Qty:	*27.4 in. x 1*
Width%:	*99*
Tip Speed:	*7,360 FPM*
Inertia:	*16 WR²*

OPERATING CONDITIONS:

Air Flow:	*3,800 CFM*
Static Pressure:	*2.22 in. Wg.*
Plenum DP:	*0.00 in. Wg.*
Inlet Grill DP:	*0.00 in. Wg.*
TSP:	*2.22 in. Wg.*
Site Altitude:	*0.00 Ft*
TSP @ Sea Level:	*2.22 in. Wg.*

MOTOR SELECTION:

Rated HP / Bypass:	*3 / No*
Frame Size:	*213T*
Nominal RPM:	*1170*
VAC/PH/HZ:	*208/3/60*
Efficiency	*Premium / 0.885*
Enclosure Type:	*ODP*
Max Inertial Load:	*85 WR²*

FAN PERFORMANCE:

RPM:	*1026*
BHP:	*1.95*
Efficiency:	*68.1%*
In/Out Velocity:	*992/1038 FPM*
Plenum Out Velocity:	*63 FPM*

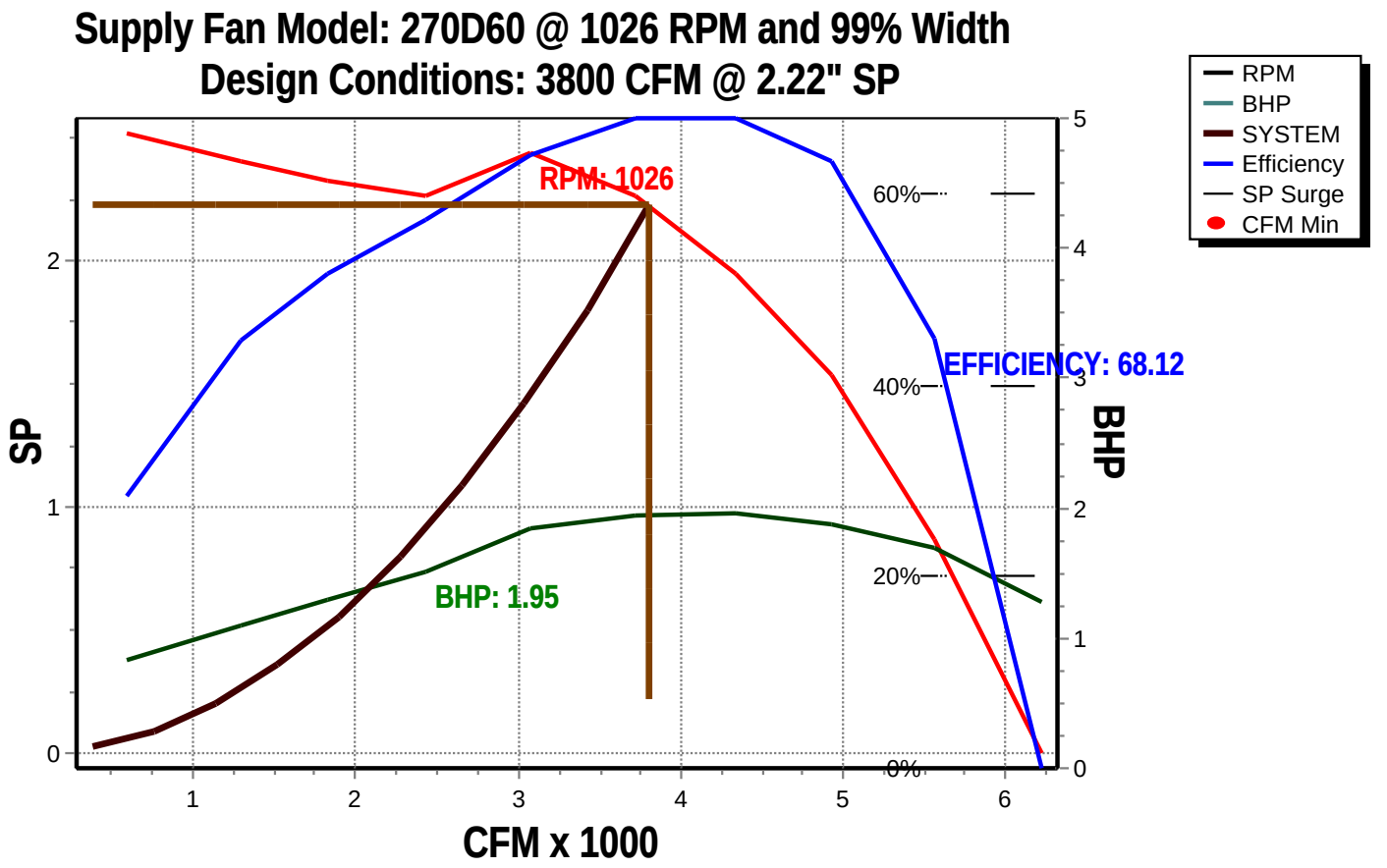
FAN SOUND POWER (Inlet/Outlet):

Octave Band: **(Re 10^-12 watts)**

1	2	3	4	5	6	7	8
83	*79*	*77*	*77*	*77*	*77*	*76*	*75*
85	*85*	*85*	*84*	*82*	*85*	*83*	*79*

SOUND POWER A-Weighted: 86 / 91 dB

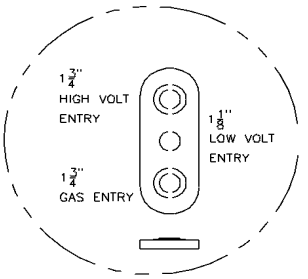
Max Duct SP with Blocked Airway: **2.4 in. Wg. @ 1026 rpm**



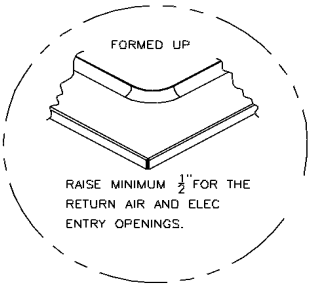
RN SERIES
C - CABINET STANDARD ~ 16-30 TON

CLEARANCES

LOCATION	◦ UNIT SIZE ◦ 16 - 30 TON
OUTSIDE AIR (BACK)	48
CONTROLS SIDE (FRONT)	48
LEFT SIDE	6
RIGHT SIDE	60
TOP	UNOBSTRUCTED



DETAIL A

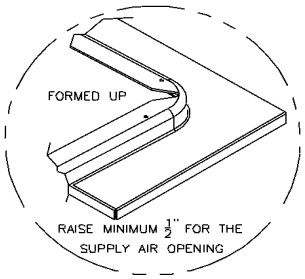


DETAIL B

NUMBER OF CONDENSER FANS

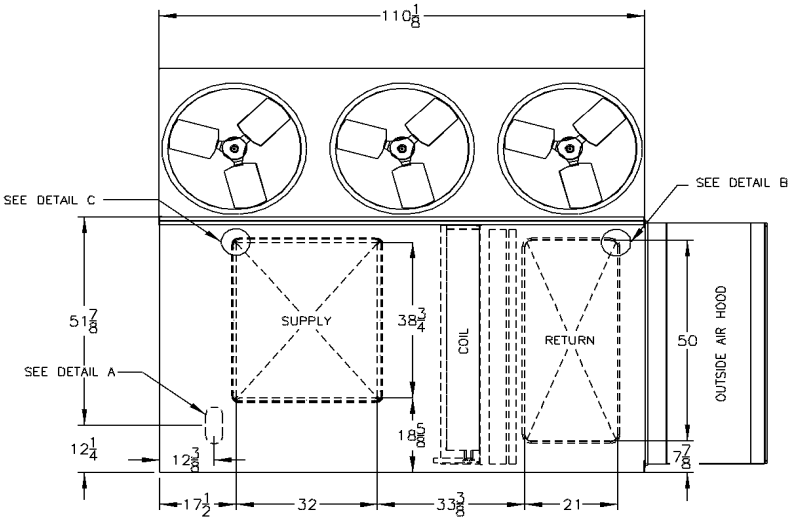
16,18 & 20 TON - 2 FANS

25 & 30 TON - 3 FANS

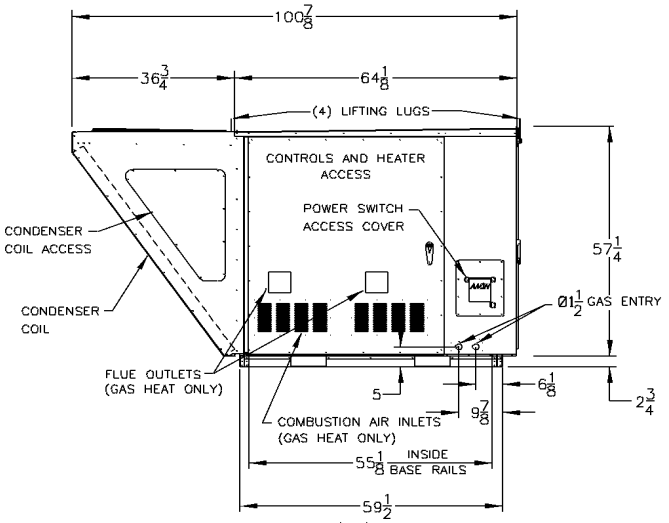


DETAIL C

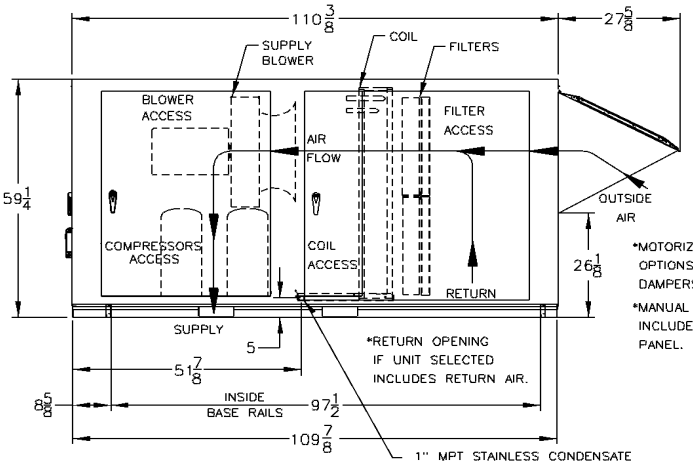
TOP VIEW



FRONT VIEW



RIGHT SIDE VIEW



*MOTORIZED O/A OPTIONS INCLUDE DAMPERS.

*MANUAL O/A OPTION INCLUDES ADJUSTABLE PANEL.

*RETURN OPENING IF UNIT SELECTED INCLUDES RETURN AIR.

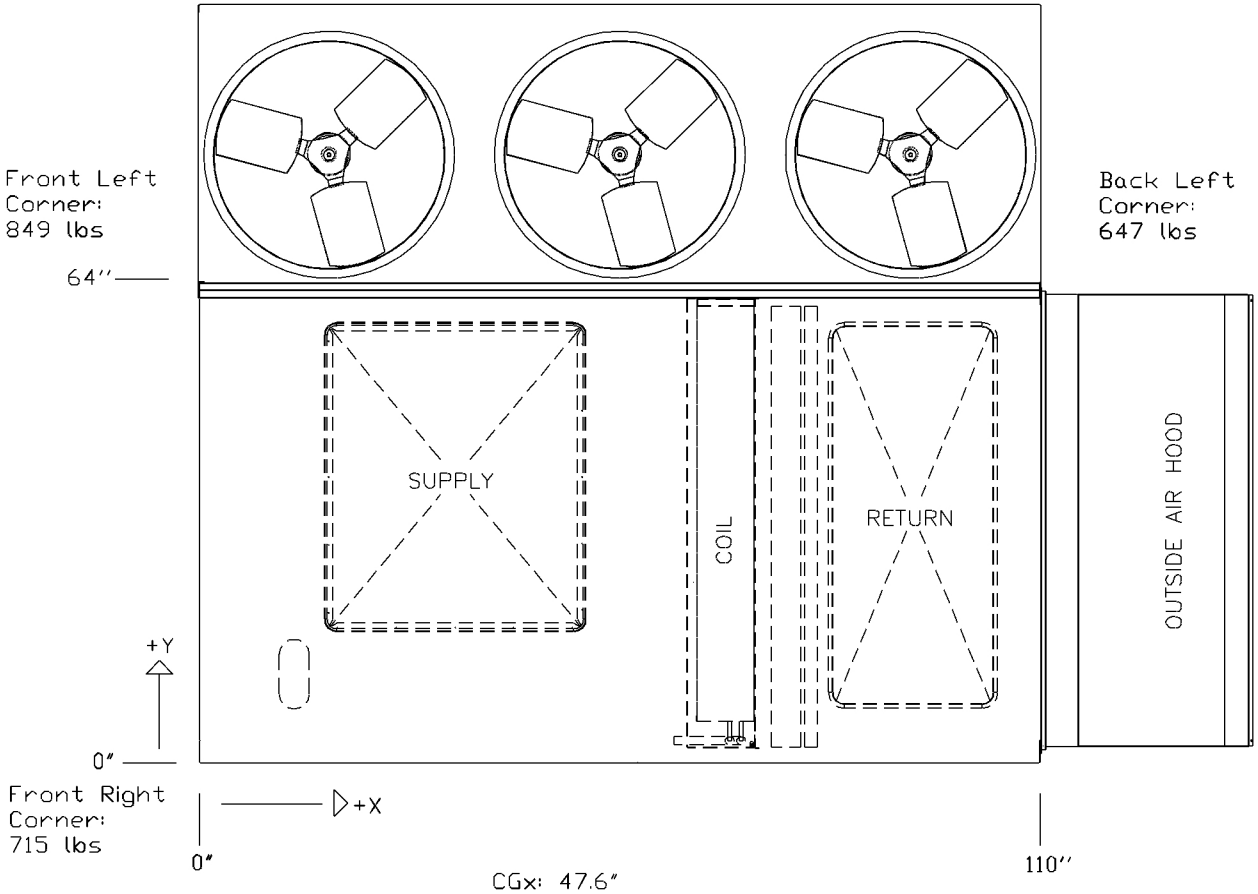
1" MPT STAINLESS CONDENSATE CONNECTION. 'P' TRAP FURNISHED BY MANUFACTURER FOR DRAIN CONNECTION.

RNC-00001 REV:D 08/20/10 JWC

NOTE: ALL DIMENSIONS ARE IN INCHES

RNC CABINET
AIR COOLED CONDENSING UNIT

RN-020-8-0-BB02-38B:M000-U0B-DQQ-B00-0JEBLBF-00-0000000VB



Disclaimer:
This weight estimate does not account for any SPAs.

SECTION 23 81 27 - MULTI-ZONE VRF HEAT PUMP SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Multi-zone Variable Refrigerant Flow (VRF) Heat Pump System
   2. Outdoor Unit Support System

B. Related Sections:
   1. Section 23 05 00– Common Work Results for HVAC
   2. Section 23 05 13– Common Motor Requirements for HVAC Equipment
   3. Section 23 05 53 – Identification for HVAC Piping and Equipment
   4. Section 23 09 00 – Instrumentation and Control for HVAC
   5. Section 23 09 93 – Sequence of Operation for HVAC Controls
   6. Division 23 23 00 – Refrigerant Piping
   7. Division 26 Sections for electrical connections.

1.02 REFERENCES

A. Air-Conditioning, Heating and Refrigeration Institute (AHRI) Publications:
   1. 210/240 “Unitary Air-Conditioning and Air-Source Heat Pump”
   2. 410 “Forced-Circulation Air-Cooling and Air-Heating Coils”

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Publications:
   1. 15 "Safety Code for Mechanical Refrigeration”
   2. 62.1 “Ventilation for Acceptable Indoor Air Quality (ANSI Approved)”
   3. 90.1 “Energy Code for Commercial and High-Rise Residential Buildings”

C. National Fire Protection Association (NFPA) Publications:
   1. ANSI/NFPA 70, “National Electrical Code”

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.
   1. Product Data: Include rated capacities, weights, furnished specialties, and accessories for each model indicated.
   2. Shop Drawings: Detail layout and installation of wall penetrations.
      a. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.
   3. Maintenance Data: For equipment to include in the maintenance manuals.

1.04 QUALITY ASSURANCE

A. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

D. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.

E. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.
F. Additional R-410A for field charge adder shall be supplied by system manufacturer.
G. Communication wire shall be supplied by system manufacturer.
H. Electrical Characteristics for HVAC Equipment other than "Basis of Design": Equipment of different electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified and the cost of which included In the HVAC contract. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Unit shall be stored and handled according to the manufacturer's recommendation..
B. Coordinate delivery of units in sufficient time to allow movement into building.
C. Handle roof mounted units to comply with manufacturer's written rigging and installation instructions for unloading and moving to final location.

1.06 COORDINATION
A. Coordinate layout and installation of units and wall or ceiling construction, where unit penetrates wall or ceiling, or is supported by it.
B. Coordinate installation of equipment supports and roof penetrations.

1.07 WARRANTY
A. General Warranty: The manufacturer shall warrant all equipment for a period of one (1) year from date of substantial completion. Extended warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Extended Warranty: The units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation. In addition the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty shall not include labor.

PART 2 - PRODUCTS

2.01 MANUFACTURERS
A. Approved Manufacturers:
1. Multi-zone VRF Heat Pumps System
a. "City Multi"; Mitsubishi (Basis of Design)
b. "VRV III"; Daikin
c. "Multi V"; LG
2. Outdoor Unit Support System
a. "Big Foot"; Rector Seal
b. Equivalent as approved.
B. The multi-zone VRF heat pump system shall be of the same manufacturer as the split-system air conditioners.

2.02 SYSTEM DESCRIPTION
A. The heat pump air system shall consist of an outdoor unit, multiple indoor units, and Direct Digital Controls.

B. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.

C The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of outdoor rated capacity.

D. System shall provide 84% of rated capacity at -13 degrees F.

2.03 Y-SERIES OUTDOOR UNIT

A. General:

The H2i Y-Series PUHY outdoor unit shall be used specifically with CITY MULTI VRF components. The outdoor units shall be equipped with multiple circuit boards that interface to the M-NET controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

1. The model nomenclature and unit requirements are shown below. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
3. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated in accordance with the installation manual.
4. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
7. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
8. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
9. The outdoor unit shall be capable of operating in cooling mode down to 23°F ambient temperatures, without additional low ambient controls.
10. The outdoor unit shall be capable of operating in cooling mode down to -13°F .
11. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.
12. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
13. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
14. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
15. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.

16. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.

B. Unit Cabinet:
   1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models)

C. Fan:
   1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external
      static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
   2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
   3. All fan motors shall be mounted for quiet operation.
   4. All fans shall be provided with a raised guard to prevent contact with moving parts.
   5. The outdoor unit shall have vertical discharge airflow.

D. Refrigerant
   1. R410A refrigerant shall be required.
   2. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

E. Coil:
   1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
   2. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
   3. The coil shall be protected with an integral metal guard.

F. Compressor:
   1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
   2. A crankcase heater(s) shall be factory mounted on the compressor(s).
   3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
   4. The compressor will be equipped with an internal thermal overload.
   5. The compressor shall be mounted to avoid the transmission of vibration.
   6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

G. Controls: The outdoor unit shall have the capability of up to 8 levels of demand control

H. Electrical:
   1. The outdoor unit electrical power shall be 208 volts, 3-phase, 60 hertz.
   2. The outdoor unit shall be controlled by integral microprocessors.
   4. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.04 4-WAY CEILING-RECESSED CASSETTE INDOOR UNIT

A. General:

1. The PLFY shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
1. The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

C. Fan:
1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

D. Filter:
1. Return air shall be filtered by means of a long-life washable filter.

E. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
7. Both refrigerant lines to the PLFY indoor units shall be insulated in accordance with the installation manual.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

G. Controls:
1. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of
compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

2.06 CEILING-CONCEALED DUCTED INDOOR UNIT

A. General: The PEFY shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating linear expansion device. The PEFY shall support individual control using M-NET DDC controllers.

B. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
1. The unit shall be ceiling-concealed, ducted.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:
1. PEFY-NMAU models shall feature external static pressure settings from 0.14 to 0.60 in. WG.
2. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
3. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
4. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function
5. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter:
1. Return air shall be filtered by means of a standard factory installed return air filter.

F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate shall be gravity drained from the fan coil.
7. Both refrigerant lines to the PEFY indoor units shall be insulated in accordance with the installation manual.

G. Electrical:
1. The unit electrical power shall be 208volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts

H. Controls:
1. This unit shall use controls provided by Mitsubishi Electric Cooling & Heating to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

2.07 VERTICAL AIR HANDLER

A. General: The PVFY shall be a vertical ducted indoor fan coil design with a fixed bottom return, a fixed vertical discharge supply, and a modulating linear expansion device.
1. The unit shall have the capability to be mounted in either the vertical or horizontal (left position only) and have the capability to integrate into systems with various types of indoor units connected.
2. The PVFY shall support individual control using M-NET DDC controllers.
3. Units shall have the ability to control supplemental heat via connector CN24 and a 12 VDC output.

B. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
1. The cabinet shall be pre-painted, pre-insultated, 22 gauge galvanized steel.

D. Fan:
1. The indoor unit fan shall be an assembly with a single direct drive fan with a high efficiency DC motor.
2. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
3. The indoor unit shall have a ducted air outlet system and ducted return air system.
4. The fan shall have 3-speeds with the capability to operate between 0.3-0.5 In.W.G. selectable.

E. Filter:
1. Provide a filter box same size as return air opening with access door. Ship loose for field installation.

F. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate shall be gravity drained from the fan coil.
7. Refrigerant lines to the PVFY indoor units shall be insulated in accordance with the installation manual.

G. Electrical:
1. The unit electrical power shall be 208volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts

H. Controls:
1. This unit shall use controls provided by Mitsubishi Electric to perform functions necessary to operate the system.

2. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8 degree F deadband from set point.

2.08 CONTROL

A. Overview: The CITY MULTI Controls Network (CMCN) shall be capable of supporting remote controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet® and LonWorks®.

B. Electrical Characteristics

1. General: The CMCN shall operate at 30VDC. Controller power and communications shall be via a common non-polar communications bus.
2. Wiring: Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit. a. Control wiring for the Simple MA remote controllers shall be from the remote controller (receiver) to the first associated indoor unit (TB-15) then to the remaining associated indoor units (TB-15) in a daisy chain configuration.
   b. Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.
   c. The AG-150 centralized controller shall be capable of being networked with other AG-150 centralized controllers for centralized control.
3. Wiring type:
   a. Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
   b. Network wiring shall be CAT-5 with RJ-45 connection.

C. Remote Controllers

1. The Backlit Simple MA Remote Controller (PAC-YT53CRAU) shall be capable of controlling up to 16 indoor units (defined as 1 group). The Backlit Simple MA Remote Controller shall be compact in size, approximately 3” x 5” and have limited user functionality. The Backlit Simple MA supports temperature display selection of Fahrenheit or Celsius. The Backlit Simple MA Remote Controller shall allow the user to change on/off, mode (cool, heat, auto, dry, setback and fan), temperature setting, and fan speed setting and airflow direction. The Backlit Simple MA Remote Controller shall be able to limit the set temperature range from the Backlit Simple MA. The Backlit Simple MA Remote controller shall be capable of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Backlit Simple MA Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit Simple MA Remote Controller shall display a four-digit error code in the event of system abnormality/error.
2. The Backlit Simple MA Remote Controller shall only be used in same group with Wireless MA Remote Controllers (PAR-FL32MA-E / PAR-FA32MA-E) or with other Backlit Simple MA Remote Controllers (PAC-YT53CRAU), with up to two remote controllers per group.
3. The Backlit Simple MA Remote Controller shall require no addressing. The Backlit Simple MA Remote Controller shall connect using two-wire, stranded, non-polar control wire to TB15 connection terminal on the indoor unit. The Simple MA Remote Controller shall require cross-over wiring for grouping across indoor units.

D. Centralized Controller (Web-enabled)

a. AE-200A Centralized Controller: The AE-200A Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple CITY MULTI outdoor units. The AE-200A Centralized Controller shall be approximately 7-1/2"x12" in size and shall be powered from a Power Supply Unit (PAC-SC51KUA). The AE-200A Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The AE-200A Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the AE-200A Centralized Controller shall include on/off, operation mode selection (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, and airflow direction setting. Since the AE-200A provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the AE-200A Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

b. The AE-200A Centralized Controller shall be equipped with one RJ-45 Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN).

c. The AE-200A Centralized Controller shall be capable of performing initial settings via the 9" high-resolution, backlit, color touch panel on the controller or via a PC using the AE-200A Centralized Controller's initial setting browser.

d. Standard software functions shall be available so that the building manager can securely log into each AE-200A via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Tenant Billing shall be available.

E. BACnet® Interface

The Mitsubishi Electric Cooling & Heating BACnet® interface, BAC-HD150, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.

F. Power Supply (PAC-SC51KUA)

The power supply shall supply 24VDC (TB3) for the AG-150/EB-50GU centralized controller and 30VDC (TB2) voltage for the central control transmission.

2.09 EQUIPMENT SUPPORT SYSTEM

A. Where multiple condensers are required to be installed on a roof surface; condensers shall be mounted on a prefabricated condenser stand assembly which is designed to spread the weight of the condensers evenly over the roof surface.

B. The condenser stand shall be mounted free standing on the roof surface in a convenient position to facilitate connection of the linesets to the condensers as well as access for maintenance.

C. Condenser stand shall be designed so that the feet and the supporting pads on which they rest do not penetrate the roofing membrane.

D. Condenser stand shall be of modular design to enable the cross members to be lineally adjusted during assembly to accept different configurations of condensers.

E. Condenser stand shall accommodate double decker cross members where space requirements mandate vertical stacking of condensers.
F. Condenser stand shall be fabricated from square steel tubing with a minimum wall thickness of 16 gauge.
G. For loads to a maximum of 660 lbs, cross members shall have a minimum cross section of 1.5" x 1.5 ".
H. For loads from 660 lbs. to 4,000 lbs. cross members shall have a minimum cross section of 2" x 2".
I. For loads in excess of 4,000 lbs. double crossbars with a minimum cross section of 2" x 2" shall be fitted.
J. Condensers shall be secured to the cross bars with pressed steel clamps which shall be bolted to the cross members.
K. Steel clamps shall allow sufficient space for anti vibration pads to be fitted under the feet of the condenser.
L. The condenser stand shall be supported on a minimum of 6 heavy duty injection molded plastic feet which shall have a surface area of at least 144 square inches.
M. The foot upon which each leg is mounted shall be capable of supporting a maximum load of 265 lbs. for the 12" x 12' foot and 485 lbs. for the 18" x 18" foot.
N. Each foot shall be mounted on a molded neoprene rubber pad to minimize vibration and to reduce stress on the roofing membrane.
O. Each foot shall be individually height adjustable to compensate for any irregularities in the roof surface.
P. Each leg shall be individually removable for reroofing or repair purposes without removing and /or decommissioning the condensers.
Q. All structural members shall be locked securely into place with locknuts.
R. All components shall be hot dip galvanized after fabrication.
S. Condenser stand shall be selected and installed strictly in accordance with the manufacturer's installation instructions.
T. Manufacturer must provide drawing with plan view depicting outdoor unit and snow stand with exact dimension and spacing of equipment.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Rig and install in full accordance with manufacturer's requirements, project drawings, and contract documents. Refer to the manufacturer's installation manual for full requirements.
B. Location: Locate indoor and outdoor units as indicated on drawings. Provide service clearance per manufacturer's installation manual. Adjust and level outdoor units on support structure. Mount the outdoor unit a minimum of 12" above the average snowfall line.
C. Components / Piping: Installing contractor shall provide and install all accessories and piping for a fully operational system. Refer to manufacturer's installation manual for full instructions.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.03 CLEANING

A. Remove dirt, and construction debris, and repair damaged finishes including chips, scratches, and abrasions.

3.04 FIELD SERVICES

A. Provide full commissioning of a City Multi system, conducted by a Mitsubishi Electric Factory Certified and Nate Certified person.

B. The service shall involve:

1. Collect the Mitsubishi Electric supplied pressure test certificate on commencement of commissioning.
2. On commencement of commissioning the system must be in an evacuated state for Professional to witness the final evacuation process.
3. Professional will inspect the integrity of the system.
4. Provide an unbiased appraisal of the installed application, based upon their experience as a manufacturer of the product.
5. Check the “as installed” drawings and make sure the pipe work runs do not exceed the operational design maximum.
6. Ensure that all grouped equipment is addressed correctly from the outset.
7. Provide a comprehensive commissioning report complete with a “true” diagnostic operating record of the functioning systems confirming that the system is operating within its design parameters and give validation of the warranty with M-service tool.
8. Make recommendations to correct any performance related problems found during commissioning.
9. A complete asset list of the equipment will be run in their database, maintaining an indefinite historical record of any calls to Mitsubishi Electric relating to this site.
10. Enhance the integrity of the 1-year Manufacturer’s Warranty by confirming the system has been commissioned correctly.
11. Maximize system operation to give optimum energy efficiency.
12. Provide Design Tool Project drawing complete with electrical professional (P.E.) stamped drawing of piping and control wiring prior to construction.

C. All work carried out shall be backed-up with a comprehensive commissioning log book. Provide three copies to the project professional.

D. Mitsubishi field start-up representative shall perform Start-up procedure and Commissioning. Service must be provided by the system manufacturer. A sub-contractor is not allowed.

E. Start-up representative shall be NATE certified in at least two categories.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel.

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in the maintenance manuals.

END OF SECTION

SECTION 238419 - NATATORIUM DEHUMIDIFICATION SYSTEM

Part 1 - General

1. **Scope**

   Split system designed for natatorium environment control including:

   A. Dehumidification
   B. Unit mounted electric coil for space heating
   C. Cooling mode with heat rejection to a remote outdoor air-cooled condenser
   D. Pool water heating from reclaimed compressor waste heat
   E. Unit mounted minimum Outdoor Air Connection

2. **Quality and Safety Assurance**

   A. The unit shall be ETL listed.
   B. Unit shall be completely factory assembled, wired, piped, and test run prior to shipping. All controls shall be factory adjusted and preset to the design conditions. A factory test report shall be available upon request.
   C. Live remote monitoring of the unit during factory testing shall be available via the Internet.
   D. The unit shall have a mechanical vestibule where the electrical panel, compressors, pool water heat exchangers, receivers and most of the refrigeration controls are out of the process air stream.
   E. Unit shall have a microprocessor controller with unit mounted refrigerant pressure transducers on each independent compressor circuit, multiple temperature sensors and an Ethernet connection for factory monitoring, adjusting and control via the internet. The refrigerant pressure transducers shall be actively used for unit control. A weekly graph of the space conditions shall be provided to the customer. Demonstration of these capabilities must be carried out at the engineer's office prior to bid day.
   F. Internet Start-Up assist: The unit shall have remote factory start-up capability via the Internet.
   G. The unit shall have 24-7 remote computer monitoring with automated alarm notifications and system performance alerts.
   H. Warranty: The entire system shall have a 24 month limited parts warranty from ship date.
      1. The system shall be covered by an additional 1-year labor warranty when it is connected to the factory via live internet monitoring system from date of initial start-up.
   I. The unit shall have live remote service capability via the internet with the ability for field service technicians to receive service and trouble alerts via email and make adjustments via smart-phone application remote control.

Part 2 - Product

1. **General**

   The natatorium control system shall include:

   A. Mechanical process dehumidification
   B. Indoor configuration
   C. Split system with remote outdoor air-cooled condenser for AC heat rejection.

D. The unit shall have a unit mounted electric heating coil, sized to meet the skin losses and outdoor air heating loads or as specified by the design engineer.
E. Pool water heating type: coaxial
F. Air filtration type: MERV 8 2-inch filters for return and outdoor air.
G. Minimum Outdoor Air connection.
H. Programmable microprocessor controller with Live, 24-7 remote internet access, monitoring and control.
I. Remote operator panel
J. Unit shall have a service vestibule where the compressor, refrigeration specialties and control valves and all electronics are outside of process air stream.

2. **Sequence of Operation**

Unit shall be designed and sized to maintain the specified conditions. The unit operation shall be as follows:

A. Unit Startup
    1. Power is turned on or system is restarted.
    2. After a short initial delay to allow sensors to stabilize, the blower starts and operates continuously.
    3. Based on unit mounted sensor feedback the unit shall begin/resume operation and will operate based on the sequence described below.
B. Airside Configuration
    1. The unit delivers specified supply air continuously to the Natatorium.
    2. The minimum exhaust air volume is set to meet the engineer's schedule.
    3. The minimum outdoor air volume is set to meet the engineer's schedule.
C. Dehumidification Mode
    1. Return air relative humidity is above humidity setpoint.
    2. Compressor starts using Compressor Start sequence.
    3. The reheat coil has full (0-100%) modulating capabilities. The reheat output will modulate to maintain the space temperature at set point year round
D. Air Conditioning Mode
    1. Return air temperature is above room temperature setpoint.
    2. Compressor starts if not already operating in dehumidification mode.
    3. Unneeded compressor hot gas is diverted to the outdoor air cooled condenser for up to 100% heat rejection at summer design ambient conditions.
E. Space Heating Mode
    1. Return air temperature is below room temperature setpoint.
    2. The Microprocessor space heating output signal (2 stages) is sent to the heating coil controller. The signal outputs will regulate based on the return air temperature.
F. Pool Water Heating Mode
    1. Return pool water temperature is below pool water setpoint.
    2. If compressor is already operating from a Dehumidification or Air Conditioning demand, the control valves divert the compressor hot gas through the coaxial heat exchanger/pool water heater and the rest of the compressor heat is rejected at either the reheat coil or the AC heat exchanger.
    3. If there is no pre-existing demand for the compressor to operate, the microprocessor sends a signal to the auxiliary pool water heater (remote by others) to operate. The compressor will not normally operate solely for a pool water heating demand unless configured to do so at the controller.

G. Freeze Protection
    1. Supply air temperature falls below freezestat setpoint or optional freezestat sensor indicates a freezestat condition.
    2. All exhaust fans are stopped and all outdoor air dampers are fully closed.
    3. Freezestat alarm is tripped. Alarm has to be manually cleared by operator.

3. **Cabinet**

A. The unit shall be designed for indoor application.
B. Cabinet Construction: All cabinet 16, 20, 24 gauge sheet metal shall be galvanized G90 steel or GalvalumeTM alloy, mill applied zinc phosphate primer followed by an exterior grade white silicone modified polyester top coat. The sheet metal is engineered to form a cabinet with maximum strength and rigidity. Panels shall be fastened to the frame with stainless steel hardware. Panels shall be isolated from the steel frame with dielectric gaskets to prevent galvanic corrosion. All seams shall be caulked with silicone inside and out to prevent air and water leakage.
    1. The cabinet walls shall be 20 gauge pre-painted steel, single-wall construction with 1-inch fiberglass insulation with anti-microbial top coat.
    2. The cabinet floor shall be 20-gauge pre-painted steel, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base frame of the unit.
    3. The cabinet roof shall be engineered with structural bending for maximum rigidity with 20-gauge steel and shall be mechanically fastened to the walls of the unit.
    4. The cabinets shall be mechanically assembled with stainless steel 5/32" sealed pop rivets. Where bolts are required bright zinc plated bolts shall be used.
    5. Access doors shall be removable, secured to cabinet using heavy-duty stainless steel hex-head bolts with stainless steel washers insulated with rubber gaskets.
C. Outdoor Air Intake:
    1. Minimum Outdoor Air connection: motorized damper, filter and time clock
D. Insulation: The unit shall be insulated per the following standards:
    1. One inch thick, surface coated with an anti-microbial layer, protected against perforation and fiber air entrainment with a reinforcing mesh.
    2. Fire resistant rating to conform to NFPA Standard 90A and 90B.
    3. Sound attenuation coefficient shall not be less than 1.00 at a frequency of 1,000 Hz as per ASTM Standard C423.
    4. Thermal conductivity shall not exceed 0.23 Btu/in-h-sq ft-F at 75 F.
E. Cabinet configuration shall include:
    1. A filter rack with separate access doors shall be provided for the return air and minimum outdoor air streams.
    2. Unit shall be equipped with duct collars to admit the minimum outdoor air as scheduled. The outdoor air intake assembly shall have a built-in air filter rack with separate access door, manual air balancing device and motorized 2 position extruded aluminum, Insulated, silicone side-sealed damper operated by 24-hour time clock.
    3. Mechanical vestibule: The unit shall have the compressor, receiver, solenoid valves and the electrical panel in a separate compartment out of the processed air stream. All components shall be serviceable while the unit is in operation without disturbing the airflow.
    4. Electrical panel: The unit shall have a built-in electrical control panel in a separate compartment in order not to disturb the airflow within the dehumidifier

during electrical servicing. All electrical components shall be mounted on a 16 gauge galvanized sub-panel.

4. **Filters**

Filters shall be standard sized, replaceable, off-the-shelf filters used throughout including:

A. Return Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure on a slide in rack.
B. Outside Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure

5. **Coils**

A. Evaporator/dehumidifier coils shall be designed for maximum moisture removal capacity.
    1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases.
    2. Coil shall have galvanized casing and end plates.
    3. Aluminum fin and copper tubes mechanically bonded to assure high heat transfer.
B. Air reheat condenser coils shall be sized for variable heat transfer into the air with a capacity of 100% of the compressors total required heat of rejection.
    1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases.
    2. Coil shall have galvanized casing and end plates.
    3. Aluminum fin and copper tube joints mechanically bonded to assure high heat transfer

6. **Drain Pans**

Each evaporator coil shall be provided with a positive draining, compound-sloped, baked powder paint coated aluminum drain pan with fully-welded corners to ensure zero water retention.

7. **Blowers and Blower Motors**

A. Supply blowers:
    1. The Supply blower shall be impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of high performance composite material. The blower shall be completely corrosion resistant and be maintenance free and is direct drive via a direct current (DC) electronic commuted (EC) motor. The EC-Motor shall have zero slippage design and have continuously variable speed control when connected to the unit’s controller.
    2. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets, and an integral controller to provide the windings with electrical current so that, the motor rotates continuously and quietly.
    3. The fan assembly shall be suitable for a maximum temperature of 60°C.
    4. The fan shall be statically and dynamically balanced on precision electronic balancers.
B. Exhaust blowers:
    1. The exhaust blower (EF1) sized to maintain the Natatorium’s negative pressure requirement during normal operation shall be remote by others and interlocked to the unit's occupancy scheduler.

8. **Dampers**

Internal dampers shall be parallel blade and made from extruded anodized Aluminum with neoprene double seal tips to minimize leakage. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant.

A. Unit shall be provided with a power open and spring return outside air and exhaust air dampers. Dampers adjust between 0% to 100% open position.
B. Outdoor air and exhaust air dampers shall be opposed blade, power open and spring return. Dampers blades shall be 3/4? insulated type made from extruded anodized Aluminum with neoprene double seal tips to minimize leakage. Damper leakage shall be less than 1% of maximum flow at 4-inch W.C. differential. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant.

9. **Pool Water Heater**

Coaxial type with corrosion resistant cupro-nickel water circuit tubing.

A. Coaxial type with corrosion resistant cupro-nickel water circuit tubing.
B. Self-purging and self-draining counter flow design.
C. Water circuit piping shall be transparent braided hose, for visual water flow confirmation.
D. Terminating connections are PVC schedule 40 NPT fittings located at the cabinet wall for easy connection.
E. Maximum loop operating pressure: 60 psig

10. **Compressors**

A. Type: Scroll type, suction gas cooled, suitable for refrigerant R-410A
B. The compressors shall be mounted on rubber in shear isolators to prevent transmission of any noise and vibration to the space below.
C. Removable crankcase heater for liquid migration protection.
D. Compressors shall be located outside the conditioned air stream in the unit's service vestibule.
E. Compressor manufacturer must have a wholesale outlet for replacement parts in the nearest major city.

11. **Refrigeration Circuit**

A. The unit shall consist of one refrigeration circuit for humidity and/or air conditioning control.
B. Refrigeration circuit shall have pressure transducers monitoring the refrigerant high and low pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need of service manifold gauges.
C. Shall have solenoid control valves, check valves, a liquid line filter drier, liquid and moisture indicator, thermostatic expansion valve and pump down solenoid valve.
D. Unit shall have an externally adjustable balanced port design mechanical thermostatic expansion valve. The valve shall have a removable power head.
E. Tamper proof, hermetically sealed non-adjustable high and low-pressure controls and refrigeration service valves shall be installed using Schrader type valves. Refrigeration service valves shall be located outside of the airstream.
F. Receiver shall have two refrigerant level (maximum and minimum) indicating sight glasses.

G. Suction line shall be fully insulated with ½ inch closed cell insulation.

12. **Control Panel**

A. Electrical contractor shall be responsible for external power wiring and disconnect switch fusing. Power block terminals shall be provided.
B. Shall be mounted inside the service vestibule outside of the process air stream.
C. Blower motors shall be protected with thermal trip overloads.
D. Unit shall have a voltage monitor with phase protection.
E. Available dry contacts shall include:
    1. Alarm
    2. Blower interlock
    3. Stage 1 & 2 heating
    4. Outdoor air damper control
    5. Remote exhaust fan #1
    6. Remote exhaust fan #2
    7. Outdoor-air cooled equipment
    8. System on
    9. Auxiliary pool heater 1
    10. Heat recovery
F. Terminals shall be provided for 24 volt power to the outdoor air cooled condenser fan contactor.
G. All wiring shall be installed in accordance with UL or CSA safety electrical code regulations and shall be in accordance with NFPA. All components used shall be UL or CSA listed.
H. Color-coding and wire numbering shall be provided for easy troubleshooting. All wires shall be in a wire duct. Wiring diagrams located near electrical panels on unit.
I. Compressors shall have a time delay start to prevent short cycling.
J. Pressure transducers for refrigerant high pressure and suction pressure shall be provided.
K. Airflow switch and dry contact for alarm shall be provided.

13. **Microprocessor Control**

A. A microprocessor controller with the following characteristics will be provided:
    1. All set points and adjustments are preprogrammed at the factory during quality control and test operation.
    2. The microprocessor program has an updatable FLASH memory.
    3. The Flash memory will be updatable via an internet connection.
    4. A minimum: 11 Analog inputs, 4 Analog outputs, 24 Digital inputs and 16 Digital outputs.
    5. Four serial interface ports including both RS232 and RS485 types.
    6. An Ethernet port with RJ-45 connector and LED activity indicator.
    7. A real time clock to time stamp unit operation log with programmable 7-day occupied/unoccupied scheduling capabilities.
    8. Two manual demand forced modes to allow user a manual bypass of the microprocessor in the event of controller failure.
    9. Keypad and display panel shall have a backlit graphic liquid crystal display.
B. Unit shall have pressure transducers monitoring the refrigerant high and low pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need of service manifold gauges.
C. The following status LEDs shall be on the controller:
    1. Alarm - indicates there has been a failure requiring service.
    2. Dehumidification - indicates that the system is dehumidifying the space.
    3. Cooling - indicates that the air-conditioning mode.

4. Pool Heating - indicates that the system is heating the pool water with recycled energy.
5. Space Heat - indicates that the space heating is operating.
6. Maintenance - indicates whether or not maintenance is required.
7. Manual - indicates that the system has been set to manual operation.

D. The following set points shall be accessible and adjustable from the display panel:
1. Space temperature
2. Space relative humidity
3. Pool water temperature

E. The following sensors shall be unit-mounted and monitored at the display panel. All information from these items shall be actively used in the control and operation strategies for the unit:
1. Refrigerant high pressure
2. Refrigerant low pressure
3. Return air temperature
4. Supply air temperature
5. Return air relative humidity
6. Entering pool water temperature
7. Leaving pool water temperature
8. Evaporator leaving air temperature
9. Suction temperature
10. Discharge temperature

F. System Fault: Shall indicate via text message to the display what systems require attention or servicing. Built-in monitoring and diagnostics shall allow the user to view the following:
1. Power Failure
2. Dirty air filter
3. Refrigerant high and low pressure
4. System off
5. Anti-short cycle delay

14. **Air Heating**

Unit-mounted electric heating system shall be sized to meet the scheduled heating capacity and have the following characteristics:

A. On/Off control.
B. Heater frame is to be galvanized steel.
C. The coils shall be machine crimped onto galvanized terminal and secured by an anti-rotating high temperature resistant premium grade ceramic socket.
D. Elements shall be crimped to monel or stainless steel terminal lugs and terminal lugs and terminal pins shall be positively prevented from corroding by means of non-round bulkhead bushings.
E. Screens are provided to protect heating elements.
F. Heating elements are open-type nickel-chromium resistance wire elements supported on premium ceramic bushings.
G. Integral and prewired components include contactors, fused control transformer, power supply terminals, control terminals and switch disc type, automatic reset thermal cut-out.
H. Unit-mounted heater is fully wired at the factory and unit shall have a single point power connection.

15. **Air Conditioning**

Air-cooled air conditioning via condenser

A. Unit shall be equipped with air conditioning mode where excess compressor heat is rejected to an outdoor air-cooled condenser. The outdoor air-cooled condenser shall be capable of rejecting 100% of the compressor heat rejection with an air on temperature at summer design conditions. The outdoor condenser shall be equipped with a 24VAC control including contactor for fan motor.
B. Unit shall be provided with a dry contact rated for 24VAC/5A to operate the remote outdoor condenser control.
C. Refrigeration circuit shall include refrigerant valves, receiver with pressure relief valve set at 650 psig, pressure control valve and pressure differential valve, and two manual shutoff valves to isolate the outdoor condenser.
D. Coils shall be tested at 600 PSIG and mounted vertically for complete surface utilization. Coils shall be counter flow with a minimum of 10 degrees of liquid sub-cooling and have adequate capacity to dissipate the total heat rejection of the system at design conditions. Condensers shall have guards to protect the coils from vandalism and weather-related damage.
E. The fan shall be a direct driven axial fan made of high-strength composite material in which the motor and controller are integrated. It includes FE2owlet blades combined with guide vanes and EC commutated direct-current external rotor motors provides maximum efficiency the quietest performance. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets, and an integral controller to provide the windings with electrical current so that, the motor rotates continuously and quietly. The fan is aerodynamically-optimized, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy and noise-optimized operation.
    1. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels.
    2. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C.
    3. Thermal contacts installed in the windings compliant with THCL 155.
    4. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection.
    5. High corrosion resistance design with high quality and reliability.

16. **Factory Performance Testing**

A. The unit shall be thoroughly tested under factory test conditions. A copy of the test report shall be available to the engineer upon request.
B. Microprocessor controls shall be factory adjusted and preset to the design conditions during testing.
C. The unit shall be accessible for real-time monitoring while in the QC test chamber upon request.

Part 3 - Execution

1. **Product Delivery, Acceptance, Storage and Handling**

A. Perform a thorough physical inspection of the unit upon delivery from the shipment carrier.
B. Identify and report any physical damage immediately to manufacturer.

C. If unit is to be stored prior to installation store in a clean, dry place. Protect from weather, dirt, fumes, water, construction, and physical damage.
D. Handle unit carefully during installation to prevent damage, breaking, denting and scoring.
E. Damaged units or damaged components shall not be installed. Contact manufacturer for RMA instructions.
F. Comply with manufacturer's rigging and installation instructions for unloading the unit and moving it to the final location.

2. **Connections**

A. Where installing piping adjacent to units, allow space for service and maintenance.
B. Duct connections: Drawings indicate the general arrangements of the ducts. Connect units to ducts with flexible duct connectors. Comply with requirements for flexible duct connectors.
C. Electrical connections: Comply with requirements for power wiring, switches and motor controls in electrical sections.

3. **Installation**

The agency responsible for start-up should work in accordance with the specifications and in accordance with the manufacturer's instructions and only by workers experienced in this type of work.

4. **Start Up**

A. Detailed instructions for start up as provided by the manufacturer must be followed.
B. Installing contractor must contact the manufacturer prior to start up to confirm start up procedures.
C. Remote internet access and control must be initiated and confirmed by the factory prior to start up for extended labor warranty to be in effect.

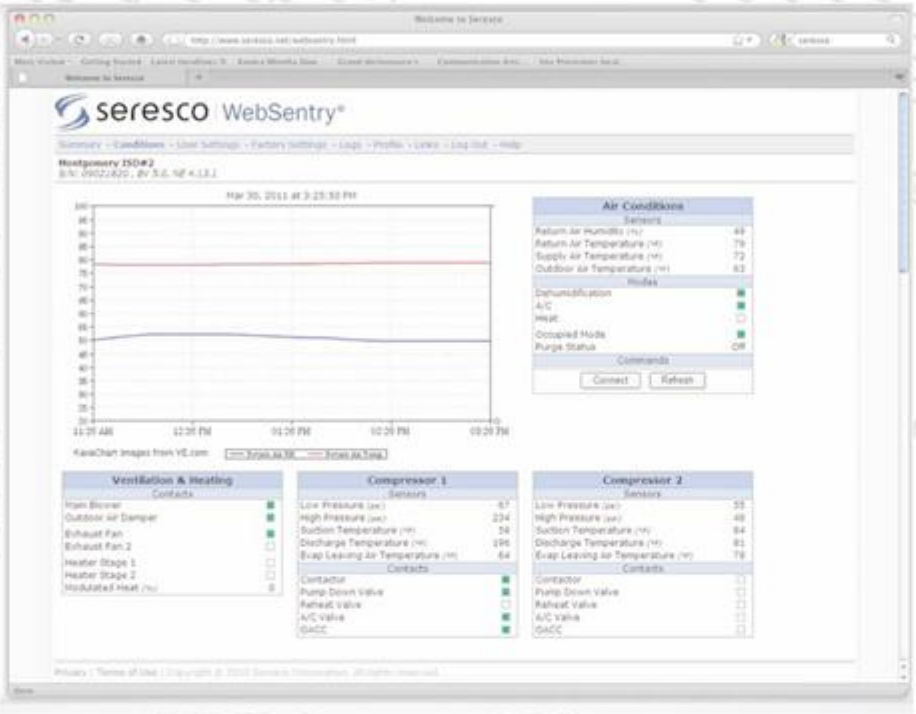
Project Name: Courtyard - Woodbury, NY

Prepared For: Tom Whiteley
HAVTECH

Seresco Model #: NE-004-VV-I-A2NT1192E1C2AE0

OACC Model #: NC-B-1V-CUC-V





https://serescodehumidifiers.com

1071 Ages Dr
Ottawa, Ontario K1G 6L3
1-770-457-3392

March 2, 2020

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Courtyard - Woodbury, NY

NE-004-VV-I-A2NT1192E1C2AE0

Model	4 Ton compressor dehumidifier
Unit Subseries	Pool Water Heater, Vented
Unit Location	Indoor
Cabinet	Vertical - Single Walled - Standard
Supply Voltage	208V/3PH
Unit Control	CommandCenter
Refrigerant	R410A
Outdoor Air	Duct Collar c/w Manual Damper & Filter
Exhaust Fan	None
Space Heating	Unit mounted electric heater - Single point power connection
Heat Control	2 stages factory wired electric heating control
Air Conditioning	Air Cooled A/C - For Use With Remote Outdoor Air Cooled Equipment
OACC Voltage	208V-240V/3PH
Warranty	Standard - 2 years on driveline, 2 years on compressor, 2 years on coils
Supply Air CFM	1900
Outdoor Air CFM	300
Supply Air Orientation	Top Supply
Outdoor Air Orientation	Top
Pool Water Connection	Side
Condensate Drain	Bottom
Heating Capacity	20.0 kW

Courtyard - Woodbury, NY

NE-004-VV-I-A2NT1192E1C2AE0

Design Data

Outdoor Air (CFM) 300
ESP . . . . . .0.5 inches
Room Conditions (°FDB/%RH) 82/60
Unit Total Airflow (CFM) 1900

Electrical Data

Unit Voltage (V/Ph/Hz) 208V/3PH/60
Unit Full Load Amps - FLA (A) 78.1
Unit MCA (A) (min circuit ampacity) 97
Unit MOP (A) (max overcurrent protect) 100

Supply Air Blower

Airflow (CFM) 1900
Type . . . . . Plenum
Unit ESP (in WC) 1.0
Number of Motors 1
Motor HP 2.2
Motor FLA (A) 5.0
Motor Drive . . . . . .Direct Drive

Compressor

Type . . . . . .Scroll
Number of compressors 1
Refrigerant R410A
Motor RLA/LRA (A) 17.6/123.0

Evaporator Coil

Sensible Capacity (MBH) 32.8
Total Capacity (MBH) 59.7
Latent Capacity (Lbs/h) 23.7
Circuits 1

Reheat Coil

Total Heat Rejection (MBH) 74.6

Pool Heating

Type . . . . . .Cupro-nickel Co-axial Vented
Capacity (MBH) 36
Water Flow Rate (GPM) 7
Water Pressure Drop (PSI) 3
Connection Size (in) 3/4
Connection Type . . . . . FTP
Connection Stub Material . . . . . PVC
Maximum Circuit Pressure Rating (PSI) 60.0

Auxiliary Heat

Location . . . . . .Unit Mounted
Type . . . . . Electric Heater
Capacity (kW) 20.0
FLA (A) 55.5
Control . . . . . .2 Stages

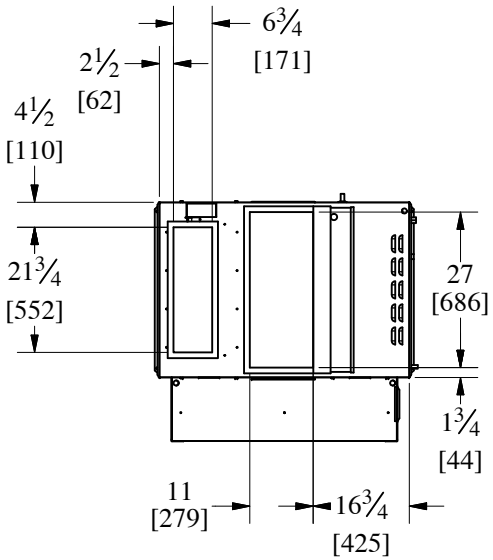
Remote Outdoor Air-Cooled Condenser

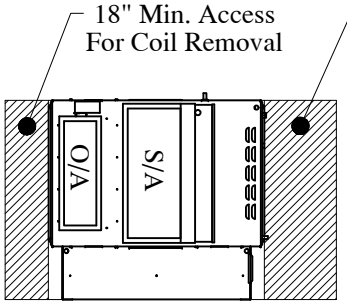
Model NC-B-1V
Design Air On Temp (°F) . . . . . .95 F
Estimated Field Charge (lbs R410A) . . . . . .TBD
Recommended line set size HG (in OD) 3/4
Recommended line set size LQ (in OD) 1/2
Maximum line length (ft) 50
Voltage (V/Ph/Hz) 208V-240V/3PH/60
Number of Motors 1
Motor HP 0.60
Motor FLA (A) 2.6
MCA (A) 4
MOP (A) 15

seresco	CAD FILE	NERV0S-F1HCO-F2THT-E9TDP-0-0-0-SHE0	
	DATE	2018-05-04	REV 2
	DRAWN BY	E.Hatin	SHEET 1 of 2
DESCRIPTION	Cab RV		

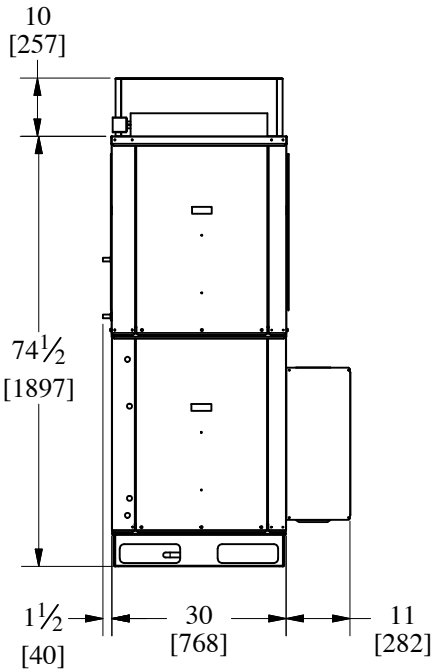
* Refer To Unit Summary Sheet For Options Selected.

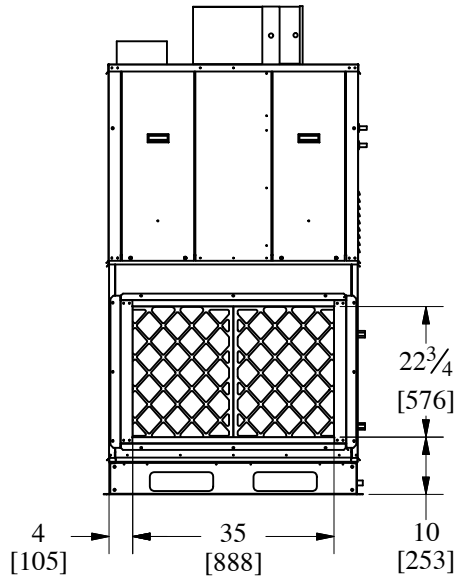
Unit Operating Weight: 860 Lbs

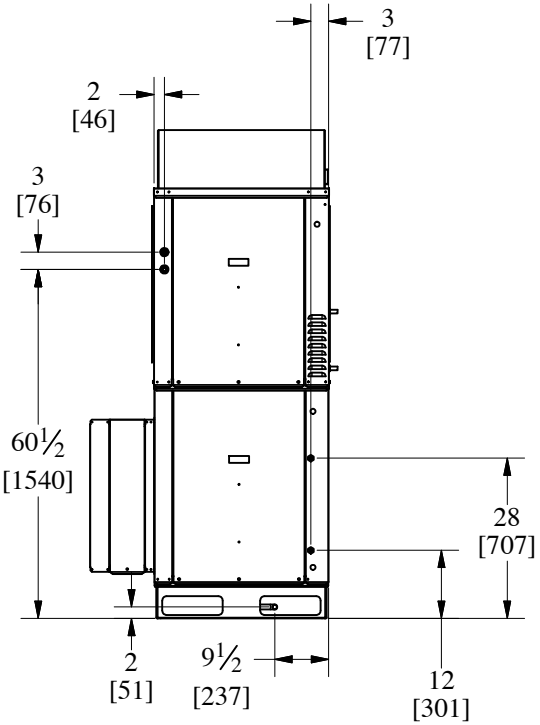


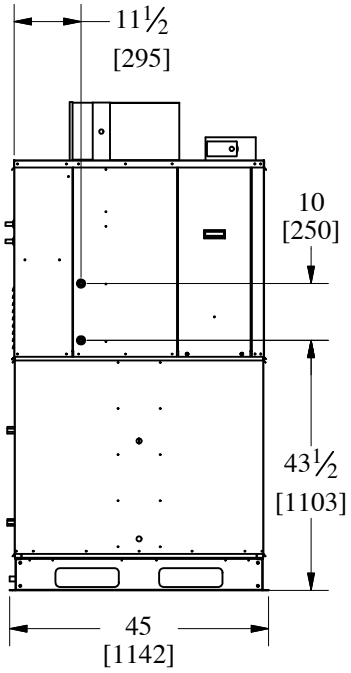


R/A

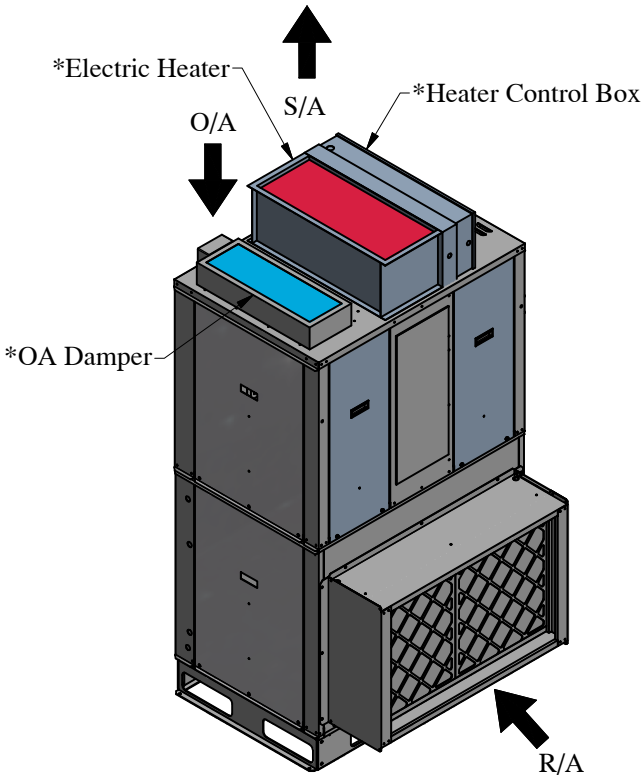


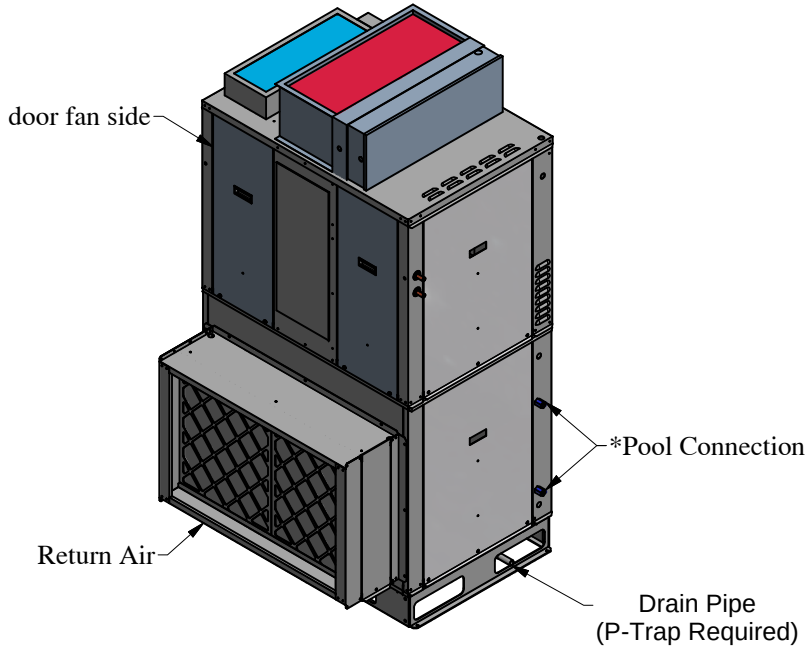


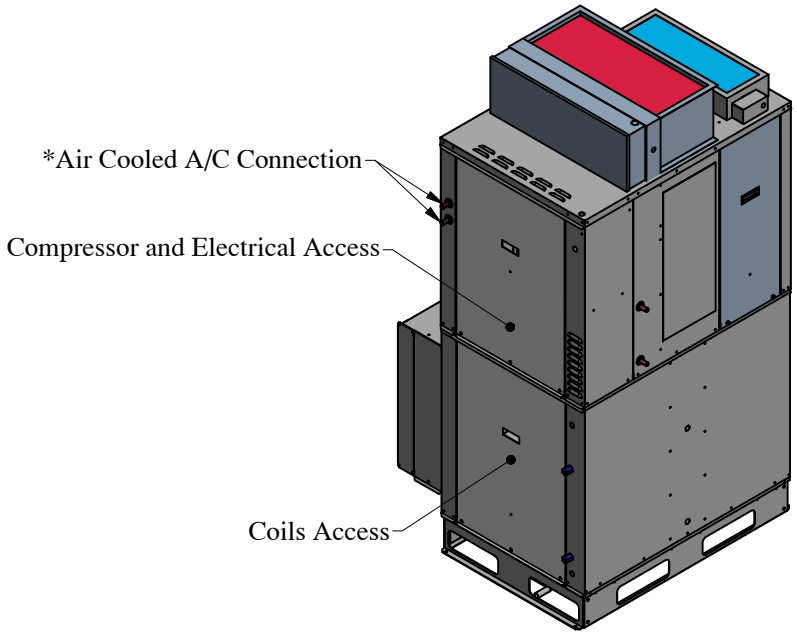


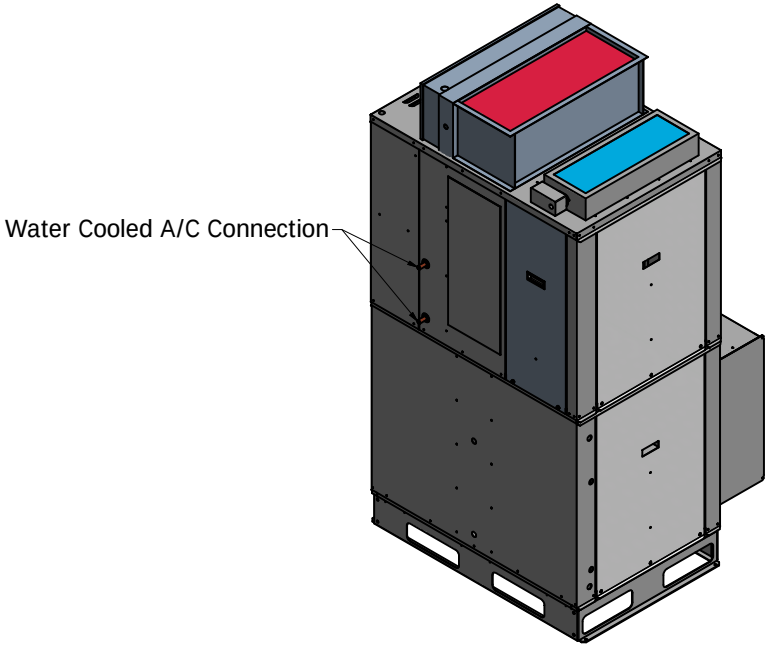


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	DATE	2018-05-04	REV 2
	DRAWN BY	E.Hatin	SHEET 2 of 2
DESCRIPTION	Cab RV		







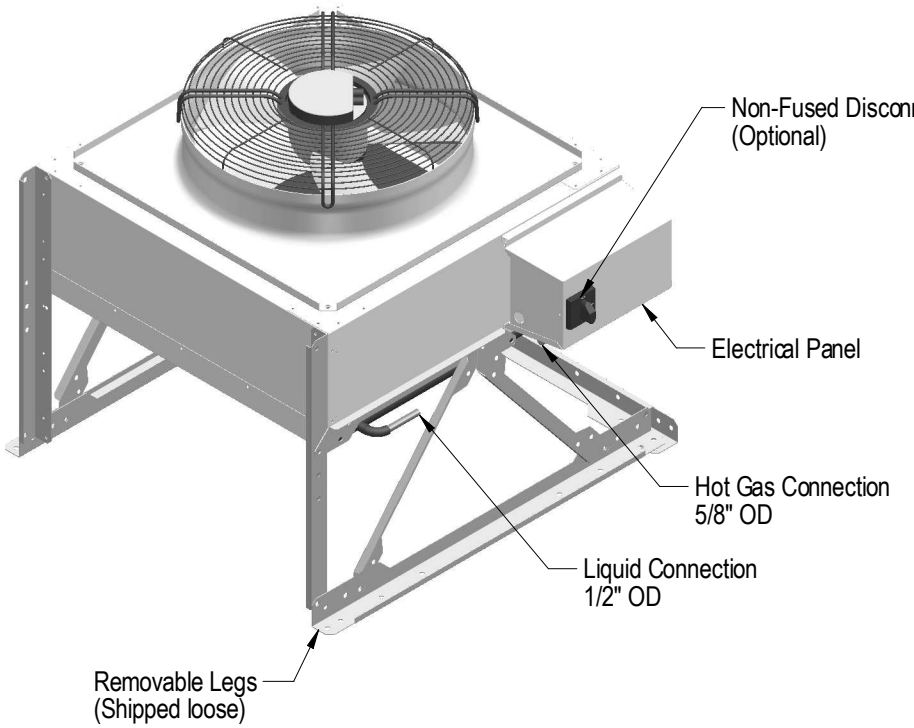


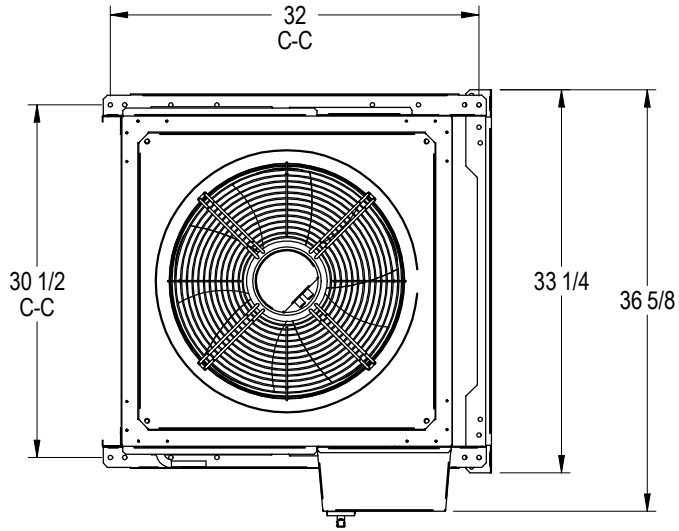
Noise level at 10' (may vary due to installation):
Low speed, 40 dBA
High speed, 50 dBA

Dehumidified AIR Solutions	
CAD FILE	NC-B-1V rev03
DATE	01/07/19
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SHEET	1 OF 1

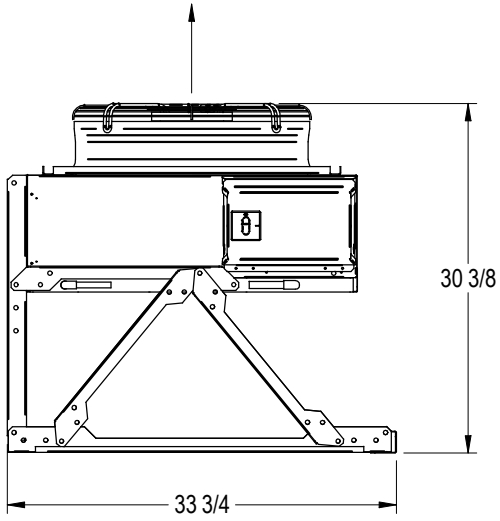
DESCRIPTION

NC-B VERTICAL AIR FLOW, 1 CIRCUIT





60" of clearance required.



Important note:
Minimum 18" of clearance all the way around for proper air flow.

UNIT OPERATING WEIGHT: 90 LBS

WEBSENTRY®TECHNOLOGY – REMOTE INTERNET CONTROL, DIAGNOSTICS AND REPORTING

There's only one way we could provide superb, factory-engineered performance after a dehumidifier leaves our plant. It's called WebSentry Technology.

WebSentry Technology provides a powerful array of capabilities designed to ensure peak operating performance, a minimum of down time and the absolute lowest cost of ownership in the industry. Like an umbilical cord back to the factory, with WebSentry, literally every aspect of the dehumidifier's performance can be monitored, recorded, analyzed and tweaked for its entire lifetime. Our recording servers are equipped with sophisticated monitoring algorithms designed to detect and protect each and every dehumidifier with literally minute by minute monitoring, 24 hours a day 7 days a week.



From regular service issues to potentially serious matters, if any kind trouble indicator is identified, instant alerts are sent to predetermined contacts including designated service technicians via email alerts. Upon notification, authorized service technicians can instantly login to the system live, to observe, adjust and control important parameters via WebSentry's web or smart phone interface.

WebSentry brilliantly solves the most challenging issues of dehumidifier industry to guarantee your client has the very best dehumidifier performance, with fewer service calls and minimum down time while enjoying the best lifetime service and value of any dehumidifier in the industry.



WebSentry® Advantages

- Premium extended 1st year warranty – parts and labor
- Fully monitored remote factory start-up capability
- Comprehensive installing contractor support
- WebSentry smart phone interface

WebSentry® Capabilities

- Remote monitoring for lifetime of dehumidifier
- Real time monitoring and alarm service
- Secure online access to real time data
- Secure remote access for set point adjustments
- Remote access with smart phone application Web

COMMANDCENTER® CONTROLLER – FOR PEAK PERFORMANCE

Seresco's CommandCenter Controller, provides unmatched space control, operating efficiency and equipment protection.

CommandCenter® Capabilities

- Automated, programmable, remote controllable system control
- Utilizes built-in pressure transducers
- Measures, monitors and controls hundreds of operating parameters
- Real time clock with battery back-up and on-board memory for data logging
- Easy to use programming interface with alternate web and smart phone control capability
- Optional remote operator panel unit can be located up to 1,000 ft. away from unit
- Allows live 24-7 monitoring, performance logging, computer analysis, and secure remote control via the Internet or smart phone with Seresco's WebSentry Technology

CommandCenter® Specifications

- Both staged and modulated control for space heating, cooling and dehumidification.
- 20 unit mounted sensors including space/pool conditions and refrigerant pressures.
- 16 digital inputs (dry contacts) used for monitoring fault conditions and external control of the unit
- 24 digital outputs and 4 analog outputs used for controlling internal and external components.
- 2 RS-485 serial ports and 1 RS-232 serial port
- 1 Ethernet port (RJ45)
- LON, Modbus, BACnet building automation option available.

Sensor Information

- Refrigerant high pressure
- Refrigerant suction pressure
- Outside air temperature
- Outside air humidity
- Air temperature leaving the evaporator
- Supply air temperature
- Compressor superheat temperature
- Compressor compartment temperature

Service Technician Mode

- History log of sensor data with date/time
- History log of alarms and status
- History log of operation
- Force modes of operation
- Adjust damper
- Calibrate damper
- Test Internal and External Contacts

Alarms

- Communication fault, Sensor fault, Dirty filter, High refrigerant pressure fault, Low refrigerant pressure fault, No airflow, Blower overload, Firestat, High supply air temperature

INDUSTRY LEADING FEATURES

Seresco dehumidifiers match or exceed the specifications of every other competitor in the marketplace.

Seresco Exclusive Features

Built-in Refrigerant Pressure Transducers

- Allow 24-7 Monitoring of critical suction and discharge pressures to ensure optimal system performance

Superior Compressor Protection

- Advanced monitoring and control technologies to protect compressors including sight glasses on receivers

Fully Dipped Coils

- Provide 100% protection against corrosion (not just the fins)

Direct Driven, Backward Inclined Airfoil Plenum Fans

- Provide powerful, quiet, efficient, reliable performance with no belts to adjust, wear out or replace
- These fans also allow factory installed auxiliary air heating while providing maximum flexibility for supply air duct options

Service Vestibule Outside Air Stream

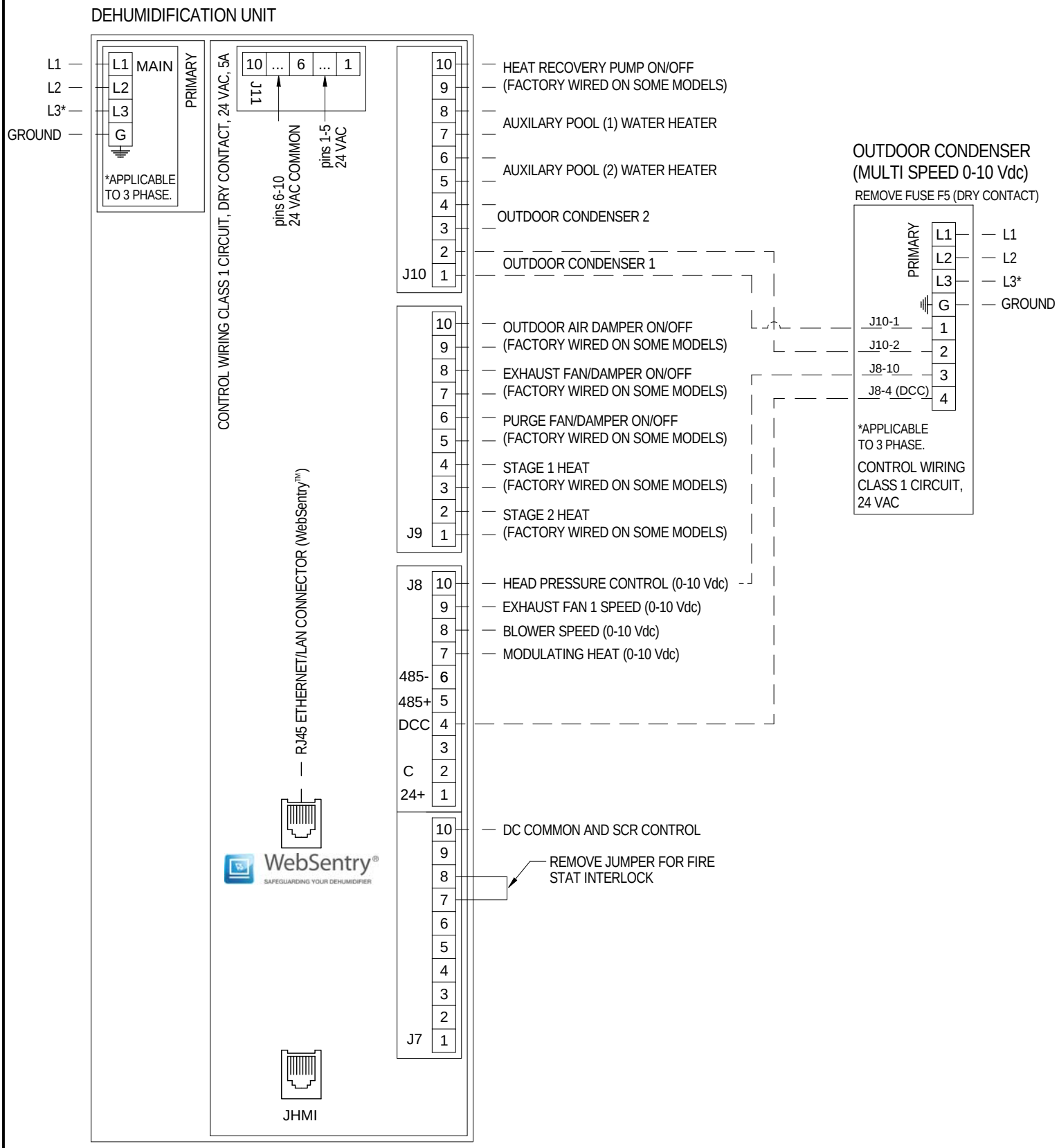
- Protects critical components from chlorinated air stream, maximizes AC efficiency, and allows unit servicing while in operation

Ultra Compact Designs

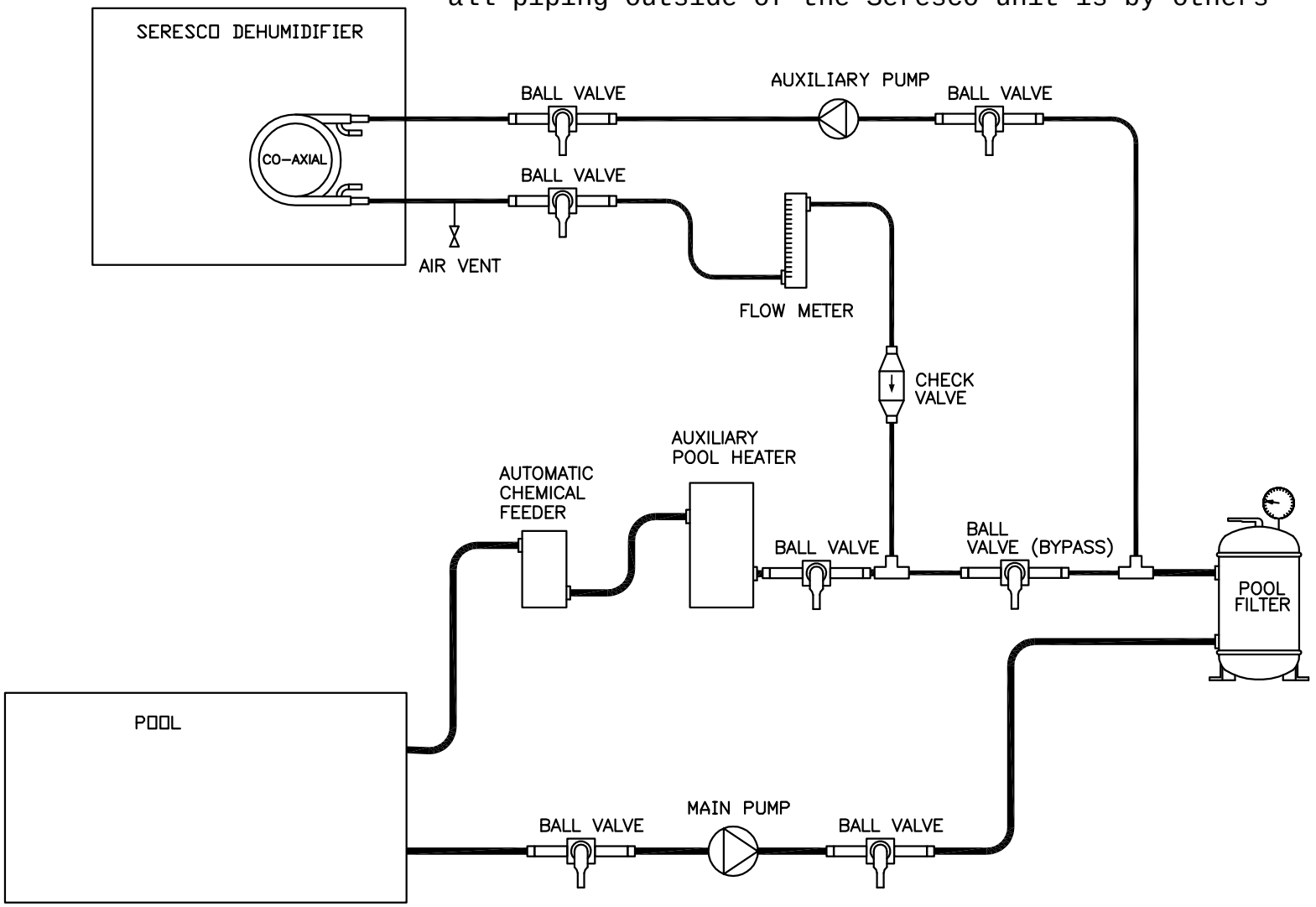
- allow twice the capacity in half the footprint (200 Series) with up to 14 tons of dehumidification fitting through a 30 inch door

DRAWING NUMBER			REV	COMMENTS	DATE	APPROVED
FWD-NE-Z-00			1			
FILE: FWD-NE-Z-00			2			
			3			
DFTN	DATE	REV #: 00	4			
J. THERIAULT	05/22/14	SHEET 1 OF 1	5			
			6			

NE Series Field Wiring Diagram with NC-Z/NC-B/NG-Z Remote Condenser



all piping outside of the Seresco unit is by others



NOTE: This drawing is to be used as reference only.

IMPORTANT NOTE: SERESCO Unit is to be ahead of chemical feeder.

seresco
Advanced Dehumidifiers
WebSentry® Technology

DRAWN BY	APP'D BY	DATE	TITRE/TITLE
J.T.	L. Vieira	Sept. 12, 2005	NE Piping Schematic for Water Heating

DRAWING NUMBER	REV.	PAGE
NEWPD	0	1 OF 1

REV.	DESCRIPTION	DATE	APPROVED

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Part 1 - General

1. **Scope**

   Furnish and install, where indicated, a factory-assembled, fully-enclosed, split environmental control system with energy recovery feature(s) designed for natatorium environment control

   Features shall include:

   A. Dehumidification by means of a direct expansion evaporator coil

   B. Space heating by means of a packaged electric resistance heating coil

   C. Cooling mode with heat rejection to a remote outdoor air cooled condenser

   D. Pool water heating from reclaimed compressor waste heat by means of a vented heat exchanger

   E. Integral minimum outdoor air connection

2. **Quality and Safety Assurance**

   A. The system shall be ETL listed

   B. The system shall be completely assembled, wired, piped, and test-run at the factory prior to shipping. All controls shall be factory adjusted to satisfy the design conditions.

   C. Wherever possible, the system shall have a mechanical vestibule where the electrical panel, compressor(s), pool water heat exchanger(s), receiver(s) and most of the refrigeration controls are out of the process air stream

   D. The system shall have a microprocessor controller with unit-mounted refrigerant pressure transducers on each refrigeration circuit, multiple temperature sensors and an Ethernet connection for factory logging and parameter adjustment via the Internet. The refrigerant pressure transducers shall be actively used for system control. The customer (or their authorised representative) shall be provided access to the online logging and parameter adjustment interface, upon request. Demonstration of these capabilities must be carried out at the engineer's office prior to bid day

   E. The system shall have remote factory start-up assistance capability, when connected to a network with Internet access

   F. The system shall have 24-7 remote computer logging capability with automated alarm notifications and system performance alerts transmitted via e-mail to authorised users, when connected to a network with Internet access

   G. Warranty: The entire system shall have a 24-month limited parts warranty from the factory ship date

      1. A 1-year labour warranty shall be provided by the manufacturer when the system is connected to the factory via an Internet monitoring system from the date of initial commissioning

   H. When connected to a network with Internet access, the system shall have remote service capability with the ability for field service technicians to receive service and trouble alerts by e-mail and make parameter adjustments via a browser interface on any Internet-capable device

Part 2 - Product

3. **General**

The natatorium control system shall include:

A. Mechanical process dehumidification

B. Indoor cabinet configuration

C. Single wall cabinet configuration for use in conditioned/ventilated mechanical spaces only

D. Split system with remote outdoor air-cooled condenser for AC heat rejection

E. A packaged electric resistance heating coil, sized as specified by the design engineer to meet the skin losses and outdoor air heating loads

F. Potable water rated coaxial condensing heat exchanger(s) with double wall vented construction for pool water heating using reclaimed compressor waste heat

G. Air filtration via MERV-8 2-inch pleated panel filters for return and outdoor air

H. Minimum outdoor air connection

I. Programmable microprocessor controller with remote Internet logging and parameter adjustment

J. A service vestibule where the compressor, refrigeration specialties, control valves and all electronics are outside of process air stream

4. **Sequence of Operation**

The system shall be designed and sized to maintain the specified space conditions

A. System Startup

1. Power is turned on or the system is restarted
2. After a short initial delay to allow the sensors to stabilize, the blower starts and operates continuously
3. Based on sensor feedback, the system shall begin or resume operation based on the sequence below

B. Airside Configuration

1. The system continuously delivers the specified supply air volume to the natatorium
2. The minimum exhaust air volume is set to meet the engineer's schedule.
3. The minimum outdoor air volume is set to meet the engineer's schedule.

C. Dehumidification Mode

1. The return air relative humidity is above the humidity setpoint
2. Return air dewpoint is above dewpoint setpoint.
3. The compressor enters the Compressor Start sequence
4. Initially, 100% of compressor hot gas discharge will be diverted to condense at the air reheat coil. The supply air temperature will be higher than the return air temperature

D. Air Conditioning Mode

1. The return air temperature is above the room temperature setpoint
2. The compressor starts, if not already operating in Dehumidification Mode
3. Excess compressor hot gas is diverted to the outdoor air cooled condenser for up to 100% heat rejection at summer design ambient conditions

E. Space Heating Mode

1. The return air temperature is below the room temperature setpoint
2. The microprocessor space heating output signal (two equal stages) is sent to the heating coil controller. The signal output will regulate based on the return air temperature

F. Pool Water Heating Mode

1. The return pool water temperature is below the pool water setpoint
2. If the compressor is already operating due to a Dehumidification or Air Conditioning demand, the control valves will divert the compressor hot gas through the coaxial heat exchanger to heat the pool water, with the remainder rejected at the air reheat coil or the AC heat exchanger
3. If there is no pre-existing demand for the compressor to operate, the microprocessor sends a signal to the auxiliary pool water heater (remote by others) to operate. The compressor will not operate solely for a pool water heating demand unless specifically configured to do so at the controller

G. Freeze Protection

1. The supply air temperature falls below the freezestat setpoint or the optional freezestat sensor indicates a freezestat condition
2. Exhaust fan(s) are stopped and outdoor air damper(s) are fully closed
3. When the freezestat alarm is tripped, it must be manually cleared by the operator

5. **Cabinet**

A. Cabinet Construction: All cabinet 16, 20 and 24 gauge sheet metal shall be galvanized G90 steel or GalvalumeTM alloy with mill-applied zinc phosphate primer followed by an exterior grade white silicone modified polyester top coat. The sheet metal is engineered to form a cabinet with maximum strength and rigidity. All seams shall be caulked with silicone to prevent air and water leakage or infiltration

1. Base Rails: The cabinet shall have a base frame comprised of formed 12 gauge mill-galvanized G90 steel that allows access to the drain connection through the forklift slots
2. The cabinet walls shall be of single-wall construction using 20 gauge pre-painted steel with 1 inch of fiberglass insulation protected by an anti-microbial top coat
3. The cabinet floor shall be of 2-inch double-wall construction using 20-gauge pre-painted steel engineered with structural bends for maximum rigidity, mechanically fastened to the base frame
4. The cabinet roof shall be engineered with structural bending for maximum rigidity with 20-gauge steel and shall be mechanically fastened to the walls of the unit
5. The cabinets shall be mechanically assembled with stainless steel 5/32" sealed blind rivets. Where bolts are required bright zinc plated bolts shall be used
6. Access doors shall be removable, secured to cabinet using heavy-duty stainless steel hex-head bolts with stainless steel washers insulated with rubber gaskets

B. Outdoor Air Intake:

1. Minimum Outdoor Air connection: duct collar, manual damper and filter

C. Insulation: The unit shall be insulated per the following standards:

1. One inch thick, surface coated with an anti-microbial layer, protected against perforation and fiber air entrainment with a reinforcing mesh
2. Fire resistant rating to conform to NFPA Standard 90A and 90B
3. Sound attenuation coefficient shall not be less than 1.00 at a frequency of 1,000 Hz as per ASTM Standard C423
4. Thermal conductivity shall not exceed 0.23 Btu/hr-sqft-ft at 75 °F

D. Cabinet configuration shall include:

1. A filter rack with separate access doors shall be provided for the return air and minimum outdoor air streams
2. Unit shall be equipped with duct collars to admit the minimum outdoor air as scheduled. The outdoor air intake assembly shall have a built in air filter rack with separate access door and manual air balancing device
3. Mechanical vestibule: The unit shall have the compressor, receiver, solenoid valves and the electrical panel in a separate compartment out of the processed air stream. All components shall be serviceable while the unit is in operation without disturbing the airflow

4. Electrical panel: The unit shall have a built-in electrical control panel in a separate compartment in order not to disturb the airflow within the dehumidifier during electrical servicing. All electrical components shall be mounted on a 16 gauge galvanized sub-panel

6. **Filters**

Wherever possible, air filters shall be standard sized, replaceable, off-the-shelf filters including:

A. Return Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure on a slide in rack

B. Outside Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure

7. **Coils**

A. Evaporator/dehumidifier coils shall be designed for maximum moisture removal capacity

1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases
2. Coil shall have galvanized casing and end plates
3. Aluminum fin and copper tubes mechanically bonded to assure high heat transfer.

B. Air reheat condenser coils shall be sized for variable heat transfer into the air with a capacity of 100% of the compressors total required heat of rejection

1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases
2. Coil shall have galvanized casing and end plates
3. Aluminum fin and copper tube joints mechanically bonded to assure high heat transfer

8. **Drain Pans**

Each evaporator coil shall be provided with a positive draining, compound-sloped, baked powder paint coated aluminum drain pan with fully-welded corners to ensure zero water retention

9. **Blowers and Blower Motors**

A. Supply blowers:

1. Each supply blower shall be an impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of a high-performance composite material directly driven via a direct current (DC) electronic commuted (EC) motor. The blower and motor shall be completely corrosion resistant and be maintenance free. The EC-Motor shall be of zero-slippage design with continuously variable speed control when connected to the system's controller
2. Each EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets, and an integral controller to provide the windings with electrical current so that, the motor rotates continuously and quietly.
3. Each fan assembly shall be suitable for a maximum temperature of 60°C
4. Each fan shall be statically and dynamically balanced on precision electronic balancers

10. **Dampers**

Internal dampers shall be made from extruded anodized aluminium with a parallel blade configuration and neoprene double-seal tips to minimize leakage. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant

11. **Pool Water Heater**

Potable water rated coaxial heat exchanger shall be double-wall vented construction with corrosion-resistant cupro-nickel water circuit tubing

A. Self-purging and self-draining counter flow design

B. Water circuit piping shall consist of transparent braided PVC hose

C. Terminating connections are PVC schedule 40 NPT fittings located at the cabinet wall for easy connection

D. The maximum loop operating pressure is 60 psig

12. **Compressors**

A. Hermetic, scroll action compressor, suction gas cooled, suitable for refrigerant R-410A

B. The compressor(s) shall be mounted on rubber-in-shear isolators to limit the transmission of noise and vibration

C. The compressor(s) shall be equipped with removable crankcase heater(s) for liquid migration protection

D. The compressor(s) shall be located outside the conditioned air stream in the system's service vestibule

E. The compressor manufacturer must have a wholesale outlet for replacement parts in the nearest major city

13. **Refrigeration Circuit**

A. The system shall consist of one refrigeration circuit for dehumidification and sensible cooling

B. Each refrigeration circuit shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need for service manifold gauges

C. All refrigeration circuits shall have solenoid control valves, check valves, a liquid line filter-drier, liquid and moisture indicator, thermostatic expansion valve and a pump down solenoid valve

D. The system shall have an externally adjustable balanced port design mechanical thermostatic expansion valve. The valve shall have a removable power head

E. Tamper proof, hermetically sealed non-adjustable high and low pressure switches and refrigeration service valves shall be installed using Schrader type valves. Refrigeration service valves shall be located outside of the airstream

F. The receiver shall have two refrigerant level (maximum and minimum) indicating sight glasses

G. The suction line shall be fully insulated with 0.500-inch closed cell insulation

14. **Control Panel**

A. The electrical contractor shall be responsible for external power wiring and disconnect switch fusing. Power block terminals shall be provided

B. Shall be mounted inside the service vestibule outside of the process air stream

C. Blower motors shall be protected with thermal trip overloads

D. The system shall have a voltage monitor with phase protection

E. Available dry contacts shall include:

1. Alarm
2. Blower interlock
3. Stage 1 & 2 heating
4. Outdoor air damper control
5. Remote exhaust fan #1
6. Remote exhaust fan #2
7. Outdoor-air cooled equipment
8. System on
9. Auxiliary pool heater 1
10. Heat recovery

F. Terminals shall be provided to send 24-volt power to the outdoor air cooled condenser or fluid cooler fan contactor

G. All wiring shall be installed in accordance with UL or CSA safety electrical code regulations and shall be in accordance with the NFPA All components used in the system shall be UL or CSA listed

H. Wiring diagrams shall be located near the electrical panel(s) on the system. These diagrams shall provide colour-coding and wire numbering for easy troubleshooting. All wires shall be contained in a wire duct.

I. The compressor(s) shall have a time delay on start to prevent short cycling

J. Pressure transducers for measuring refrigerant discharge (high) pressure and suction (low) pressure shall be provided.

K. An airflow switch and a dry contact for alarm(s) shall be provided

15. **Microprocessor Control**

A. A microprocessor controller with the following characteristics will be provided:
   1. All set points and parameter adjustments are pre-programmed at the factory during quality control testing
   2. The microprocessor program shall be stored on updatable FLASH memory
   3. A minimum of 11 analogue inputs, 4 analogue outputs, 24 digital inputs and 16 digital outputs
   4. Four serial interface ports including both RS232 and RS485 types
   5. An Ethernet port with RJ-45 connector and LED activity indicator
   6. A real time clock to time-stamp the system operation log and to enable a programmable 7-day occupation schedule
   7. Two manual demand forced modes to allow the user to manually bypass the microprocessor in the event of controller failure
   8. The local and remote operator panel(s) shall have a backlit graphic liquid crystal display with touch controls

B. The system shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need of service manifold gauges.

C. The following status LEDs shall be on the controller:
   1. Alarm - indicates there has been a failure requiring service.
   2. Dehumidification - indicates that the system is dehumidifying the space.
   3. Cooling - indicates that the air-conditioning mode.
   4. Pool Heating - indicates that the system is heating the pool water with recycled energy.
   5. Space Heat - indicates that the space heating is operating.
   6. Maintenance - indicates whether or not maintenance is required.
   7. Manual - indicates that the system has been set to manual operation.

D. The following set points shall be accessible and adjustable from the operator panel:
   1. Space temperature
   2. Space relative humidity
   3. Pool water temperature

E. The following sensors shall be unit-mounted and monitored at the operator panel. All information from these items shall be actively used in the system control and operation strategies:
   1. Refrigerant high pressure
   2. Refrigerant low pressure
   3. Return air temperature
   4. Supply air temperature
   5. Return air relative humidity
   6. Entering pool water temperature
   7. Leaving pool water temperature
   8. Evaporator leaving air temperature
   9. Suction temperature
   10. Discharge temperature

F. System Fault: Shall indicate via text message to the display what systems require attention or servicing. Built-in monitoring and diagnostics shall allow the user to view the following:
   1. Power failure
   2. Dirty air filter
   3. Refrigerant high and low pressure

4. System off
5. Anti-short cycle delay

16. **Auxiliary Air Heating**

The packaged electric heating system shall be sized to meet the scheduled heating capacity and have the following characteristics:

A. Binary (on/off) air heat control

B. The heater frame shall be made from galvanized steel

C. The resistance-heating coils shall be machine crimped onto galvanized terminals, secured by an anti-rotating high temperature resistant premium grade ceramic socket

D. Heating elements shall be crimped to Monel or stainless-steel terminal lugs.Terminal lugs and pins shall be positively prevented from corroding by means of non-round bulkhead bushings

E. Screens shall be provided to protect the heating elements

F. Heating elements shall be open-type nickel-chromium resistance wire elements supported on premium ceramic bushings

G. Integral and prewired components shall include contactors, a fused control transformer, power supply terminals, control terminals and a thermal cut-out switch (disc type, automatic reset)

H. The packaged heater is fully wired at the factory and the system shall have a single point power connection

17. **Air Conditioning**

Air-cooled air conditioning via outdoor condenser

A. The system shall be equipped with an air conditioning mode where excess compressor heat is rejected to an outdoor air-cooled condenser. The outdoor air-cooled condenser shall be capable of rejecting 100% of the compressor heat rejection with an air-on temperature at summer design conditions. The outdoor condenser shall be equipped with 24VAC controls, including a contactor for the fan motor

B. The system shall be provided with a dry contact rated for 5A at 24VAC to operate the remote outdoor condenser controls

C. Each refrigeration circuit shall include refrigerant valves, a receiver with pressure relief valve set to 650 psig, a pressure control valve and a pressure differential valve, and two manual shutoff valves to isolate the outdoor condenser

D. Coils shall be tested at 600 PSIG and mounted vertically for complete surface utilization. Coils shall be counter flow with a minimum of 10 degrees of liquid sub-cooling and have adequate capacity to dissipate the total heat rejection of the system at design conditions. Condensers shall have guards to protect the coils from vandalism and weather-related damage

E. The fan(s) shall be direct driven axial fan(s) made of aluminum in which the motor and controller are integrated. The fan includes an EC commutated direct-current external rotor motor to provide maximum efficiency and the quietest performance. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets and an integral controller to provide the windings with electrical current so that the motor rotates continuously and quietly. The fan has an aerodynamically-optimised, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy and noise-optimised operation

1. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels
2. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C
3. Thermal contacts installed in the windings compliant with THCL 155
4. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection
5. High corrosion resistance design with high quality and reliability

18. **Factory Performance Testing**

A. The system shall be thoroughly tested under factory test conditions.

Part 3 - Execution

19. **Product Delivery, Acceptance, Storage and Handling**
    A. Perform a thorough physical inspection of the system upon delivery from the shipment carrier
    B. Identify and immediately report any physical damage to manufacturer
    C. If the system is to be stored prior to installation, store in a clean, dry place protected from weather, dirt, fumes, water, construction and physical damage
    D. Handle the system carefully during installation to prevent damage
    E. Damaged systems or components shall not be installed. Contact the manufacturer for RMA instructions
    F. Comply with the manufacturer's rigging and installation instructions for unloading the system and moving it into position
20. **Connections**
    A. Where installing piping adjacent to the system, allow space for service and maintenance
    B. Duct connections: drawings indicate the general arrangements of the ducts. Connect the system to ducts with flexible duct connectors. Comply with code requirements for flexible duct connectors
    C. Electrical connections: comply with code requirements for power wiring, switches and motor controls in electrical sections
21. **Installation**
    The agency responsible for start-up should work in accordance with the specifications and in accordance with the manufacturer's instructions and only by workers experienced in this type of work
22. **Start Up**
    A. Detailed instructions for start up as provided by the manufacturer must be followed
    B. Installing contractor must contact the manufacturer prior to start up to confirm start up procedures
    C. Remote Internet access and control must be initiated and confirmed by the factory prior to start up for extended labour warranty to be in effect

General Policy

This warranty applies to the original equipment owner and is not transferable. Seresco Technologies Inc. warrants as set forth and for the time periods shown below that it will furnish, through a Seresco Technologies Inc. authorized installing contractor or service organization, a new or rebuilt part for a factory installed part which has failed because of a defect in workmanship or material.

Warranty Void Unless Registered

Warranty is void unless, upon start-up of the unit, the "Warranty Registration and Start-up Report" is completed and sent to the factory within one week of initial start-up. This report will also register the compressor warranty with the compressor manufacturer.

Initial 90-day Warranty

During the first 90 days from initial start-up and prior to the completion of the 24th month from date of shipment, whichever comes first and **subject to prior written approval from the factory**, Seresco Technologies Inc. will provide and/or reimburse the required labor, materials, and shipping and handling costs incurred in the replacement or repair of a factory installed defective part. The labor required to replace the defective part is warranted. Travel time, diagnostic time, per diems, truck charges, etc. are not covered under this warranty.

WebSentry Conditional One Year Extended Labor Warranty

The initial 90-day warranty shall be extended for a total of 12 months from initial start-up and prior to the completion of the 24th month from date of shipment, whichever comes first and **subject to prior written approval from the factory**. The provided equipment must be connected and communicating to Seresco's WebSentry online control and monitoring service from start-up for the entire term of the warranty extension. Seresco Technologies Inc. will provide and/or reimburse the required labor, materials, and shipping and handling costs incurred in the replacement or repair of a factory installed defective part. The labor required to replace the defective part is under warranty. Travel time, diagnostic time, per diems, truck charges, etc. are not covered under this warranty.

Two Year Parts Warranty

If any factory installed part supplied by Seresco Technologies Inc. fails because of a defect in workmanship or material prior to the completion of the 24th month from date of shipment, Seresco Technologies Inc. will furnish a new or rebuilt part F.O.B. factory. No labor reimbursement will be made for expenses incurred in making field adjustments or parts replacement outside the Initial 90-day Warranty. Seresco Technologies Inc. reserves the right to have the defective part returned to the factory in order to determine the warranty applicability. Parts shipping and handling costs (to and from the factory) are not covered outside of the Initial 90-day Warranty.

Replacement Part Warranty

If a replacement part provided by Seresco Technologies Inc. under this warranty fails due to a material defect prior to the end of the Two Year Parts Warranty (or the end of the extended warranty period if applicable) or 12 months from date of the replacement part shipment, whichever comes first, Seresco Technologies Inc. will furnish a new or rebuilt part F.O.B. factory.

Applicability

This warranty is applicable only to products that are purchased and installed in the United States and Canada. This warranty is NOT applicable to:

1. Products that have become defective or damaged as a result of the use of a contaminated water circuit or operation at abnormal water temperatures and/or flow rates.
2. Parts that wear out due to normal usage, such as air filters, belts and fuses. Refrigerant lost during the parts warranty will be reimbursed in accordance to the current market price of refrigerant at the time of repair. Seresco Technologies Inc. will not be responsible for refrigerant lost from the system due to improperly installed contractor piping to the remote outdoor air cooled condenser.
3. Refrigerant coils that corrode due to improperly balanced pool chemistry or corrosive air quality.
4. Components that have been relocated from their original placement at the factory.
5. Any portion of the system not supplied by Seresco Technologies Inc.
6. Products on which the model and/or serial number plates have been removed or defaced.
7. Products which have become defective or damaged as a result of unauthorized opening of refrigeration circuit, improper wiring, electrical supply characteristics, poor maintenance, accidents, transportation, misuse, abuse, fire, flood, alteration and/or misapplication of the product.
8. Products not installed, operated and maintained as per Seresco Technologies Inc. Owner’s Manual.
9. Products on which payment is in default.

Limitations

This warranty is given in lieu of all other warranties. Anything in the warranty notwithstanding, any implied warranties of fitness for particular purpose and merchantability shall be limited to the duration of the express warranty. Manufacturer expressly disclaims and excludes any liability for consequential or incidental damage for breach of any express or implied warranty.

Where a jurisdiction does not allow limitations or exclusions in a warranty, the foregoing limitations and exclusions shall not apply to the extent of the legislation, however, in such case the balance of the above warranty shall remain in full force and effect.

This warranty gives specific legal rights. Other rights may vary according to local legislation.

Force Majeure

Seresco Technologies Inc. will not be liable for delay or failure to provide warranty service due to government restrictions or restraints, war, strikes, material shortages, acts of God or other causes beyond Seresco Technologies Inc. control.

Optional Extended Warranties

The following extended warranties are available to purchase before the shipment of the unit:

- Extended Five Year Compressor Warranty
- Extended Five Year Airside Coil Warranty
- Extended 10 Year Airside Coil Warranty
- Extended Five Year Driveline Warranty

SECTION 25 51 10 - INTEGRATED AUTOMATION CONTROL OF GUESTROOM EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Provide a complete, integrated hotel guestroom automation system for the following:

a. HVAC Equipment.

1) Motion Sensor Thermostats

1.02 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit "Letter of Conformance" in accordance with Section 01 33 00 indicating specified items selected for use in project with the following supporting data.

1. Product Data: Submit the Manufacturer's product data and installation instructions for each component and system.

2. Shop Drawings: Submit list of components and equipment to be supplied, including proposed locations, clearances, and power requirements.

3. Operations and Maintenance Manual: Submit the Manufacturer's standard operations and maintenance manual, including emergency maintenance provider.

4. Qualifications: Submit documentation from the Manufacturer and Installer indicating qualifications listed under Quality Assurance.

5. Warranty: Submit the Manufacturer's standard one-year labor and parts warranty for turnkey installation.

1.03 QUALITY ASSURANCE

A. Qualifications of Manufacturer: The Manufacturer shall have a minimum of 20 years documented experience manufacturing integrated room automation systems having similar or more stringent requirements than the system for the current project. The Manufacturer shall submit a list of at least 15 completed projects using similar integrated room automation systems.

B. Qualifications of Installer: Submit a letter signed by the Manufacturer stating that the Installer is licensed by or acceptable to the Manufacturer of the integrated room automation system.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory-labeled packages. Store and handle in strict compliance with the Manufacturer's instructions and recommendations. Protect from damage. Sequence deliveries to avoid delays, but minimize on-site storage.

1.05 COORDINATION

A. Conference: Convene a pre-installation conference to establish procedures to coordinate this work with related and adjacent work.

B. Coordination: Furnish inserts and anchors that must be built into other work. Work closely with installers of finish materials so that units are properly aligned with adjacent materials.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Avendra, LLC Preferred Manufacturers:

1. None

B. Approved Manufacturers:

1. INNCOM by Honeywell (860-739-4468)

2.02 SYSTEM DESCRIPTION

1. Master Light Switch:

a. Acceptable Products:

1) "S-Series Switch Model EVORA"; INNCOM by Honeywell

b. 1-Button Switch shall be labeled "MASTER OFF".

c. Relay Version, 120Vac, 500 Watt maximum load.

d. Color: match adjacent wiring devices

2. Magnetic Door Switch:

a. Acceptable Products:

1) "Magnetic Door Switch Model #S241"; INNCOM by Honeywell

b. Coordinate with Section 08 71 00 "Door Hardware" for installation of Magnetic Door Switch.

B. HVAC Controls:

1. HVAC Type: The control strategy will be dependent on the type of HVAC equipment that is being proposed. The control equipment shall be compatible with the HVAC equipment with 4 relay control specified for Project. Refer to Section 23 81 13.15 "Vertical Packaged Terminal Air-Conditioning Units". The following control strategies shall be applied:

a. Vertical Terminal Air Conditioners (VTAC): The System shall control one VTAC in each room. The System shall directly control a 1 or 2-speed, low-voltage interface. The System will also control the compressor and associated heating equipment. INNCOM by Honeywell will provide the VTAC Vendor with the necessary card or connectors to be installed at point of manufacture or in the rooms. In case of existing VTAC's, the same equipment can be installed in place by trained personnel. The System shall provide automatic switchover from heating to cooling operation at each room.

2. HVAC Control Strategies: Provision shall be made to prevent the system from switching repeatedly from cooling to heating and back while attempting to maintain a constant target temperature. The System's temperature-control performance shall meet the requirements defined below for proportional valves. The System's humidity-refresh performance shall meet the requirements defined below.

a. Temperature Control: The System in the room shall employ a PID algorithm to minimize fan speed and valve changes and to reduce servo-loop error. Such error, measured as the temperature difference between the set target temperature and the measured room temperature, shall not exceed 1.0° C under steady-state conditions and will automatically compensate for changes in the heat/cooling load of the room. The temperature control algorithm shall be capable of using the full resources of the FCU to maintain target temperature. Proportional-only algorithms that set the fan speed in proportion to the error shall not be accepted (as they cause a temperature control error that increases with the fan speed).

b. Humidity Refresh: The System in the room shall be capable of maintaining a maximum level of humidity. The refresh cycle will activate in unoccupied rooms only.

   1) Humidity Refresh Cycle: The room air conditioning shall be activated on a pre-defined duty cycle to remove excess humidity. The System shall monitor, via central sensors or individual room sensors, the air temperature and relative humidity. When the relative humidity exceeds a preset threshold, the room AC shall be activated if the AC has been shut down for a period of time that exceeds a programmable time value (for example, if the AC has not run for the last one hour).

c. Fan Speed Control: Fan speed shall be selected automatically by the System to match the heat gain/loss in the room. Fixed-fan operation shall also be available to the guest. Fan speeds shall be field-programmable to allow limiting fan speeds to a desired range of speeds. Fan operation shall be configurable to provide for "Continuous Fan" or "Automatic Fan." Continuous Fan means that the fan shall run even when the target temperature has been satisfied. Automatic Fan means that the fan shall run only on active heating or cooling call.

d. Multiple HVAC Zone Rooms (Suites): The System shall be capable of supporting multi-zone rooms, where the rooms are not separated by a door, yet each room has multiple HVAC units. The System shall be able to link the thermostats in these rooms so that they track. This prevents having one room call for heat while the other is calling for cooling.

e. Temperature History: The System shall have the capability to store the temperature, valve, and fan states for each room for at least three months, with all changes being reported.

f. Energy Conservation:

   1) The System shall provide optimized energy conservation measures with minimum inconvenience to the guest. At least four setback strategies shall be employed: two when a room is un-rented (either occupied by staff or unoccupied), and two more when a room is rented (either occupied or unoccupied).

   2) The System shall determine room occupancy automatically. The System shall keep the room status as occupied even while the guest is asleep.

   3) Setback values and related parameters shall be independently adjustable for rented and un-rented modes.

g. Digital Thermostat: The unit shall be modular in construction so that each of the modules can be added at a later time if not installed initially.

1) Acceptable Product: "e4 Smart Digital Thermostat Model #e528 with Integral Passive Infrared (PIR) Motion Sensor"; INNCOM by Honeywell

2) The System shall include a wall-mounted, illuminated digital thermostat. The thermostat will be able to display current room temperature, target temperature, and outside temperature in degrees F and degrees C, as well as the humidity level.

3) The thermostat shall be easy to operate, and shall allow changing the target temperature in steps of 1 degree F or 0.5 degree C. Clear indication shall be provided when the HVAC has been turned off.

4) The thermostat shall have the capacity to work with a built-in Passive Infrared (PIR) motion sensor OR a remote Passive Infrared (PIR) motion sensor OR combinations of both.

5) The thermostat shall be capable of directly controlling HVAC units operating on voltages ranging from 12VDC to 277VAC without the requirement of secondary control relays for the higher voltage applications. The thermostat shall also be available in a battery operated version to facilitate installation where the provision of power may not be practical.

6) The thermostat shall be connectable to the System via a 2-conductor, low-voltage cable. The thermostat shall also have the capability of connecting to the HVAC equipment wirelessly via RF signals.

7) The thermostat shall be capable of controlling HVAC units wirelessly using RF (Zigbee) technology.

3. Occupancy Detection: The System shall combine inputs from the door-position switch and from a PIR motion detector to determine whether the room is occupied at any time. Activation of any switch on the digital thermostat or any light switch that is controlled by the System while the entry door is closed shall place the room in the occupied mode.

PART 3 EXECUTION

3.01 INSTALLATION

A. There shall be strict compliance with the Manufacturer's instructions and recommendations. The onset of work shall indicate that the Installer accepts the existing substrates and conditions. System installation shall be coordinated with related and adjacent work.

B. The system shall be tested for proper operation in accordance with the Manufacturer's commissioning guide. Damaged components shall be repaired or replaced until the proper operation is achieved.

3.02 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting up and shutting down, troubleshooting, servicing, and maintaining cooling towers.

2. Review data in maintenance manuals.

3. Schedule training with Owner, through Owner's Representative, with at least seven days' advance notice.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Supporting Devices for Electrical Components
2. Electricity-Metering Components
3. Concrete Equipment Bases
4. Cutting and Patching For Electrical Construction
5. Touchup Painting

1.2 REFERENCES

A. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

B. National Electrical Manufacturers Association (NEMA) Publications:

1. 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: For electricity-metering equipment.
2. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
3. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. 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.

B. Comply with NFPA 70.

C. All work to be in accordance with latest requirements of the N.E.C. and all other applicable codes and regulations of authorities having jurisdiction over the work.

1.5 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.

2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Section 08 31 00 - "Access Doors."

E. Coordinate all work with Division 21, 22, & 23. Electrical Contractor shall provide all wiring and final connection to all line voltage thermostats. Thermostat provided and installed by Division 23.

F. All electrical drawings are to be read in conjunction with the project specifications and all other related contract drawings.

G. The contractor shall examine the site and observe the conditions under which the work will be done or other circumstances which will affect the contemplated work. No allowance will be made subsequently in the connection for any error or negligence on the contractor's part.

H. The contractor shall verify exact location, size and extent of all existing utilities, obstructions and/or other conditions which may affect the proposed work under the project. The contractor shall take every precaution to prevent damage to existing work and shall repair any damage as a result of this work.

I. The contractor shall verify all door swings in the field and mount switches on knob side of doors or as approved by the engineer.

J. The contractor shall carefully examine all contract drawings/specifications and be responsible for the proper fittings of materials and equipment at each location as indicated without substantial alteration. The drawings are generally diagrammatic and because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Furnishing such fittings that are required to meet such conditions shall be furnished and installed at no cost.

PART 2 PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.

2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.2 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.

B. Meter Sockets: Comply with requirements of electrical power utility company.

2.3 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials: As specified in Section 03 30 00 - "Cast-in-Place Concrete."

2.4 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Coordinate work with other trades and install conduit and boxes to clear embedded ducts, openings, etc. and all structural features.

F. Unless otherwise noted, mounting heights, as shown, are from finished floor to top of panelboard and to centerline of other equipment. Coordinate all mounting heights with contract drawings, local code requirements, and all A.D.A. requirements.

1. Toggle (snap) switch: 4’-0”.
2. Enclosed circuit breaker: 5’-0”
3. Disconnect (safety) switch: 5’-0”.
4. Motor starter: 5’-0”.

5. Panelboard: 6’-0”.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations, Pool Equipment Rooms, Storage Rooms and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.

2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: spring-tension clamps on steel.
6. Light Steel: Sheet-metal screws.
7. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.5 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Section 07 84 00 - “Firestopping."

3.6 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi 28-day compressive-strength concrete and reinforcement as specified in Section 03 30 00 - "Cast-in-Place Concrete."

3.7 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.8 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electricity-metering components.
3. Concrete bases.
4. Cutting and patching for electrical construction.
5. Touchup painting.

3.9 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Section 09 90 00 - "Painting."

3.10 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00 (16050)

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.2 REFERENCES

A. National Electrical Manufacturer's Association (NEMA) Publications:

1. WC 26 "Binational Wire and Cable Packaging Standard"
2. WC 70 "Nonshielded Power Cables Rated 2000 Volts or less for the Distribution of Electrical Energy"

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

C. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors"
2. 486B "Standard for Wire Connectors for Use With Aluminum Conductors"

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

B. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

1.6 COORDINATION

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Owner's Representative.

PART 2 PRODUCTS

2.1 BUILDING WIRES AND CABLES

A. Approved Manufacturers:

1. American Insulated Wire Corp.; Leviton Manufacturing Co. (800-366-2492)
2. Carol Cable Co., Inc. (401-728-7000)
3. Southwire Company (800-444-1700)
4. General Cable

B. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.

C. Rubber Insulation Material: Comply with NEMA WC 70.

D. Thermoplastic Insulation Material: Comply with NEMA WC 70.

E. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 70.

F. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 70.

G. Conductor Material: Copper

H. Stranding: Solid conductor for No. 10 AWG and smaller; stranded conductor for larger than No. 10 AWG.

I. Multiconductor Cable: Metal-clad cable, Type MCI.

2.2 CONNECTORS AND SPLICES

A. Approved Manufacturers:

1. AMP Incorporated (800-522-6752)
2. General Signal; O-Z/Gedney Unit (203-584-0571)
3. Square D Co.; a Division of Groupe Schneider (888-778-2733)
4. Thomas & Betts (800-816-7809)
5. Burndy

B. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A.	Service Entrance:	Type RHW or THWN, in raceway
B.	Horizontal Feeders:	Type THHN/THWN, in raceway
C.	Vertical Feeders:	Type THHN/THWW in raceway or type MC cable

D.	Fire-Pump Feeder:	Type MI, 3-conductor
E.	Horizontal Branch Circuits:	Type THHN/THWN, in raceway
F.	Vertical Branch Circuits:	Type THNN/THWW in raceway or Type MC Cable
G.	Fire alarm Circuits:	Power-limited, fire-protective, signaling circuit cable.
H.	Class 1 Control Circuits:	Type THHN/THWN, in raceway.
I.	Class 2 Control Circuits:	Power-limited cable, concealed in building finishes

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."

B. Pull Conductors: Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 26 05 00 - "Common Work Results for Electrical."

F. Seal around cables penetrating fire-rated elements according to Section 07 84 00 "Firestopping."

G. Identify wires and cables according to Section 26 05 53 "Identification for Electrical Systems."

3.4 CONNECTIONS

A. Conductor Splices: Keep to minimum.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 26 05 19 (16120)

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding of Electrical Systems and Equipment.

a. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.2 REFERENCES

A. ASTM International (ASTM) Publications:

1. B3 “Standard Specification for Soft or Annealed Copper Wire”

2. B8 “Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft”

3. B33 “Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes”

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE) Publications:

1. C2 “ASC C2 Eighth Interim Collection of the National Electrical Safety Code ®”

2. 81 “Instrumentation and Measurement”

3. 837 “Substations”

C. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

2. 780 “Standard for the Installation of Lightning Protection Systems”

D. Underwriter's Laboratories, Inc. (UL) Publications:

1. 96 “Standard for Safety for Lightning Protection Components”

2. 467 “Grounding and Bonding Equipment”

3. 486A “Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: For the following:

a. Ground rods.

1.4 QUALITY ASSURANCE

A. 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.

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Chance/Hubbell (573-682-5521)

b. Copperweld Corp. (931-433-7177)

c. Thomas & Betts, Electrical (800-816-7809)

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 26 05 19 - "Low-Voltage Electrical Power Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

E. Grounding Electrode Conductors: Stranded cable.

F. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

G. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B3.

2. Assembly of Stranded Conductors: ASTM B8.

3. Tinned Conductors: ASTM B33.

H. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.

2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.

3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

I. Ground Conductor and Conductor Protector for Wood Poles: As follows:

1. No. 4 AWG minimum, soft-drawn copper conductor.

2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir, or cypress or cedar.

J. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

K. Equipment Ground Conductor (Green) shall be included with all circuit conductors. In addition, provide a neutral conductor where applicable.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: copper-clad steel.

1. Size: 120" long by 3/4" in diameter.

PART 3 EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

D. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

G. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

H. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.

2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

I. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

J. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

G. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connections with clean, bare metal at points of contact.

3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A .

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

C. Pad-Mounted Transformers and Switches: Install two ground rods and counterpoise circling pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned-copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.6 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

   a. Equipment Rated 500 kVA and Less: 10 ohms.

   b. Equipment Rated 500 to 1000 kVA: 5 ohms.

   c. Equipment Rated More Than 1000 kVA: 3 ohms.

   d. Substations and Pad-Mounted Switching Equipment: 5 ohms.

   e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Owner representative promptly and include recommendations to reduce ground resistance such as a chemical ground system or others that are available and approved by the Consulting Engineer.

END OF SECTION 26 05 26 (16060)

SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Raceways include the following:
   a. RMC.
   b. PVC, Schedule 40 or 80.
   c. EMT.
   d. FMC.
   e. LFMC.
   f. LFNC.
   g. RNC.
   h. Wireways.
2. Boxes, enclosures, and cabinets include the following:
   a. Device boxes.
   b. Floor boxes.
   c. Outlet boxes.
   d. Pull and junction boxes.
   e. Cabinets and hinged-cover enclosures.

B. Related Sections:

1. Section 07 84 00 (07840) - Firestopping.
2. Section 26 05 00 (16050) – Common Work Results for Electrical: For raceways and box supports.
3. Section 26 27 26 (16140) - Wiring Devices: For devices installed in boxes and for floor-box service fittings.

1.02 REFERENCES

A. American National Standards Institute (ANSI) Publications:

1. C80.1 “Electrical Rigid Steel Conduit (ERSC)”
2. C80.3 “Steel Electrical Metallic Tubing (EMT)”

B. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. ANSI/NEMA FB 1 “Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable”
2. ANSI/NEMA OS 1 “Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”
3. 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”
4. RN 1 “Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit”
5. TC 2 “Electrical Polyvinyl Chloride (PVC) Tubing and Conduit”
6. TC 3 “Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing”

C. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

D. Occupational Safety & Health Administration (OSHA) Regulations:

1. 1910.7 “Definition and Requirements for a Nationally Recognized Testing Laboratory”

E. National Electrical Contractors Association (NECA) Publications:

1. 111 “Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI)”

F. Underwriter's Laboratories, Inc. (UL) Standards:

1. 1660 “Liquid-Tight Flexible Nonmetallic Conduit”

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. LFMC: Liquidtight flexible metal conduit.

D. LFNC: Liquidtight flexible nonmetallic conduit.

E. RMC: Rigid metal conduit.

F. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Product Data: For raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electric Code".

B. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70 "National Electric Code" Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

3. Comply with NECA 111 “Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI)”

1.06 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:

1. Metal Conduit and Tubing:

a. Anixter Brothers, Inc. (800-323-8166)

b. Carol Cable Co., Inc. (401-728-7000)

c. Wheatland Tube Co. (800-257-8128)

2. Flexible Conduit:

a. Carol Cable Co., Inc. (401-728-7000)

b. Electri-Flex Co. (800-323-6174)

3. Nonmetallic Conduit and Tubing:

a. Hubbell, Inc.; Raco, Inc. (800-722-6437)

b. Lamson & Sessions; Carlon Electrical Products (800-322-7566)

c. Thomas & Betts Corp. (800-816-7809)

4. Conduit Bodies and Fittings:

a. Emerson Electric Co.; Appleton Electric Co. (800-727-5102)

b. Hubbell, Inc.; Killark Electric Manufacturing Co. (314-531-0460)

c. Lamson & Sessions; Carlon Electrical Products (800-322-7566)

5. Metal Wireways:

a. Hoffman Engineering Co. (203-425-8900)

b. Keystone/Rees, Inc. (219-495-9811)

c. Square D Co.; a Division of Groupe Schneider (888-778-2733)

6. Boxes, Enclosures, and Cabinets:
    a. Hoffman Engineering Co.; Federal-Hoffman, Inc. (203-425-8900)
    b. Hubbell Inc.; Killark Electric Manufacturing Co. (314-531-0460)
    c. Thomas & Betts Corp. (800-816-7809)

2.02 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.

C. EMT and Fittings: ANSI C80.3.

1. Fittings: Set-screw or compression type.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.03 NONMETALLIC CONDUIT AND TUBING

A. RNC: NEMA TC 2, Schedule 40 or 80 PVC.

B. RNC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

C. LFNC: UL 1660.

2.04 METAL WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

D. Wireway Covers: As indicated

E. Finish: Manufacturer's standard enamel finish.

2.05 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

2.06 FLOOR BOXES

A. Floor Boxes: Cast metal, fully adjustable, rectangular.

2.07 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.08 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRING METHODS

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid steel.

2. Concealed: Rigid steel.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Indoors: Use the following wiring methods:
1. Exposed on ceilings and wall in Mechanical Equipment Rooms galvanized rigid steel conduit.
2. Concealed in spaces above hung ceiling and wall: Electrical Metallic Tubing (EMT).
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.

C. Underground or concrete encased:
1. Schedule 40 PVC.

3.03 INSTALLATION - GENERAL

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Do not install aluminum conduits embedded in or in contact with concrete.

C. Set floor boxes level and adjust to finished floor surface.

D. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

E. Size all conduits supplying motors and associated control equipment to include equipment grounding conductor sized per NFPA 70 whether or not shown on the drawings or specified.

F. Unless otherwise noted, terminate all conduits stubbing up inside rooms or roof as follows:
1. Conduits for AC power: Stub up 6” above finished floor and provide concrete sill to protect stub-ups.
2. On PVC conduit for AC power and control cable, provide PVC to galvanized steel rigid conduit adaptor.
3. Plug or cap all conduits during construction or until permanent conductors are installed. Taped ends will not be allowed.

G. In exposed conduit runs longer than 300 feet, expansion fittings shall be installed. Where embedded conduit crosses a structural expansion joint, expansion and deflection fitting shall be installed.

H. Tighten set screws of threadless fittings with suitable tools.

I. Complete raceway installation before starting conductor installation.

3.04 INSTALLATION - RACEWAYS

A. Minimum Raceway Size: 3/4-inch trade size (DN21).

B. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

C. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

D. Install raceways level and square and at proper elevations. Provide adequate headroom.

E. Support raceways as specified in Section 26 05 00 (16050) - "Basic Electrical Materials and Methods."

F. Use temporary closures to prevent foreign matter from entering raceways.

G. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

H. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

I. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.

J. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

K. Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1-inch concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit or rigid steel conduit, before rising above floor.

L. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

M. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

N. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box.

O. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

P. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

Q. Telephone and Signal System Raceways, 2-Inch Trade Size (DN53) and Smaller: In addition to the above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

3.05 INSTALLATION - ACCESSORIES

A. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as the boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

B. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.

C. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

D. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.06 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.07 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Brady USA, Inc. (800-541-1686)

2. Panduit corp. (800-777-3300)

3. Seton Identification Products (800-571-2596)

2.2 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.

2. Legend: Indicates voltage

B. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

C. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

D. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.

2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.

4. Printed legend indicating type of underground line.

E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

G. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.

H. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

2.3 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.

2. Tensile Strength: 50 lb minimum.

3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: According to color-coding.

PART 3 EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.

2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

3. Apply the following colors to the systems listed below:

   a. Fire Alarm System: Red.

   b. Fire-Suppression Supervisory and Control System: Red and yellow.

   c. Combined Fire Alarm and Security System: Red and blue.

   d. Security System: Blue and yellow.

   e. Mechanical and Electrical Supervisory System: Green and blue.

   f. Telecommunication System: Green and yellow.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Circuit Identification Labels on Boxes: Install labels externally.

1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.

2. Concealed Boxes: Plasticized card-stock tags.

3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

H. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

I. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.

1. Color-code 208/120-V system as follows:

   a. Phase A: Black.

   b. Phase B: Red.

   c. Phase C: Blue.

   d. Neutral: White.

   e. Ground: Green.

2. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

K. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Emergency system boxes and enclosures.
5. Disconnect switches.
6. Enclosed circuit breakers.
7. Motor starters.
8. Push-button stations.
9. Power transfer equipment.
10. Contactors.
11. Remote-controlled switches.
12. Dimmers.
13. Control devices.
14. Transformers.
15. Telephone switching equipment.
16. Fire alarm master station or control panel.
17. Security-monitoring master station or control panel.

END OF SECTION 26 05 53

SECTION 26 05 74 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment and provide protective device settings from coordination study.

1.2 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals..

1. Coordination/Arc-flash study input data, including completed computer program input data sheets.

2. Coordination/Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.

a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Electrical Systems Analysis Study Software Developer, Arc-Flash Study Specialist and Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1. Maintenance manual shall include final as-left protective device settings.

1.5 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Electrical Systems Analysis Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Electrical Systems Analysis Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, a member of the International Electrical Testing Association (NETA), and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:

1. SKM Power Tools
2. ETap
3. EasyPower

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate mandatory features as listed in IEEE 399.

2.2 COORDINATION/ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:

1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output:

1. Utility Short Circuit information
2. Calculated Line-Line and Line-Ground faults at all buses.
3. Table showing equipment AIC rating vs. calculated faults.

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

1. TCC Curves showing coordination of protective devices.
2. Basis of setting for each TCC curve.
3. Recommended settings table for all adjustable protective devices.

G. Arc-Flash Study Output:

1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
    a. Voltage.
    b. Calculated symmetrical fault-current magnitude and angle.
    c. Fault-point X/R ratio.
    d. No AC Decrement (NACD) ratio.

e. Equivalent impedance.

f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.

g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

H. Incident Energy and Flash Protection Boundary Calculations:

1. Arcing fault magnitude.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.
5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with short circuit, coordination and arc-flash studies only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" as described above.
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" as described above.
3. Calculate maximum and minimum contributions of fault-current size.
4. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
5. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

C. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

D. Include low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

E. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

F. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.

G. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.

2. When the line terminals of the circuit breaker are separate from the work location.

H. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" as described above.
2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" as described above.

3. Call discrepancies to the attention of Architect.

4. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.

B. Electrical Survey Data: Gather and tabulate the following input data to support study.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Obtain electrical power utility impedance at the service.

3. Power sources and ties.

4. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.

5. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.

6. Motor horsepower and NEMA MG 1 code letter designation.

7. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.4 ARC FLASH LABELS

A. Provide and install Arc Flash labels on all equipment.

B. Labels shall be professionally produced and meet all requirements outlined in NFPA 70E and as required by OSHA.

3.5 PROTECTIVE DEVICE SETTING

A. Engage the services of a NETA certified contractor to set all protective devices from the approved settings list.

B. Update the settings list for any field adjustments made and include in the operatons and maintenance manual.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION 260574

SECTION 26 09 33 - CENTRAL DIMMING CONTROLS

PART 1 SUMMARY

A. Section Includes:

1. Central Dimming Control Systems.

B. Related Sections:

1. Section 26 27 26 - Wiring Devices
2. Section 26 51 00 – Interior Lighting

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers () Publications:

1. C62.41 “Surge Voltages in Low-Voltage AC Power Circuits”

B. ASTM International (ASTM) Publications:

1. D4674-02a “Standard Practice for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Office Environments”

C. Canadian Standards Association (CSA) Publications:

1. C22.2 No.14 “Industrial Control Equipment”
2. C22.2 No.184 “Solid-State Lighting Controls”
3. C22.2 No 156 “Solid-State Speed Controls”

D. International Electrotechnical Commission (IEC) Publications:

1. 801-2 “Electrostatic Discharge Testing Standard.
2. IEC/EN 60669-2-1 “Switches for household and similar fixed electrical installations - electronic switches”

E. International Organization for Standards (ISO) Publications:

1. 9001:2000 – Quality Management Systems.

F. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. WD 1 “General Color Requirements for Wiring Devices”

G. Underwriter's Laboratories, Inc. (UL) Standards:

1. UL
2. 489 “Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures”
3. 508 “Standard for Industrial Control Equipment”
4. 1472 “Solid-State Dimming Controls”
5. 924 “Emergency Lighting and Power Equipment”

1.03 SYSTEM DESCRIPTION

A. Central dimming control system

1. Factory assembled dimming and switching panels, interfaces and modules.
2. Low voltage wall stations, control interfaces, and sensors.
3. Solid-state LED dimming ballasts.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

1. Shop Drawings, which are to include the following:
    a. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
    b. Schematic of system.
2. Product Data: Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years' experience in manufacture of architectural lighting controls.

B. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.

C. Central dimming control system:

1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.

D. System Maintenance

1. Capable of providing on-site service support within 24 hours anywhere in continental United States.
2. Offer renewable service contract on yearly basis, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system startup.

E. Tech Support

1. Provide factory direct technical support hotline 24 hours per day, 7 days per week.

1.06 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 32 degrees to 104 degrees F.
2. Relative humidity: Maximum 90 percent, non-condensing.
3. Lighting control system must be protected from dust during installation.

1.07 WARRANTY

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

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace the following that fail in materials or workmanship within two (2) years from date of Substantial Completion.

1. 100 Percent Replacement Parts for Manufacturer Lighting System Components
2. 100 Percent Manufacturer Labor Coverage to Troubleshoot and Diagnose a Lighting Issue
3. First–Available Onsite or Remote Response Time
4. 24 Hours Per Day, 7 Days Per Week Telephone Technical Support, excluding Manufacturer Holidays
5. Remote Diagnostics for Applicable Systems

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. Subject to compliance with requirements, provide the products indicated for each designation in the Light Fixture Matrix.

    a. None.

B. Approved Manufacturers:

1. Subject to compliance with requirements, provide the products indicated for each designation in the Light Fixture Matrix.

    a. Lutron Electronics Co., Inc. (888-588-7661)

    b. Eaton Cooper Lighting Business

        1) Contact: Kathleen Kenny (678-447-5208)

2.02 GENERAL

A. Provide hardware that is designed, tested, manufactured, and warranted by a single manufacturer.

B. Architectural Lighting Controls: Ten-year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F to 104 degrees F and 90 percent non-condensing relative humidity.

C. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.

2.03 DIMMING / RELAY PERFORMANCE REQUIREMENTS

A. Electrolytic capacitors to operate at least 20 degrees C below the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 104 degrees F ambient temperature.

B. Load Handling Thyristors (SCRs and triacs), Field Effect Transistors (FETs), and Isolated Gate Bipolar Transistors (IGBTs): The component’s maximum current rating to be at least two times the dimmer’s/relay’s rated operating current.

C. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer/relay.

D. Surge Protection:

1. Design and test dimmers/relays to withstand line-side surges without impairment to performance.

2. Panels: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41.

E. Utilize air gap off, activated when user selects “off” at any control to disconnect the load from line supply.

F. Power failure memory and dimmer/relay recovery:

1. When power is interrupted and subsequently returned, within 3 seconds lights will automatically return to same levels (dimmed setting, full on, or off) prior to power interruption.

G. Dimmers:

1. Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage (plus or minus 2 percent change in RMS voltage/cycle), frequency shifts (plus or minus 2 Hz change in frequency/second), dynamic harmonics, and line noise.

2. Systems not providing cycle-by-cycle compensation to include external power conditioning equipment as part of dimming system.

3. Each dimmer to incorporate electronic "soft-start" default at initial turn-on that smoothly ramps lights up to the appropriate levels within 0.5 seconds.

4. Control all light sources in smooth and continuous manor. Dimmers with visible steps are not acceptable.

5. Each dimmer to be assigned a load type that will provide a proper dimming curve for the specific light source.

6. Possess ability to have load types assigned per circuit, configured in field.
7. Minimum and maximum light levels user adjustable on output-by-output basis.
8. Low Voltage Dimming Modules; Meet following requirements:
    a. Coordination between low voltage dimming module and line voltage relay: Capable of being electronically linked to single zone.
    b. Single low voltage dimming module; capable of controlling following light sources:
        1) 0-10V analog voltage signal.
            a) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
            b) Sink current via IEC 60929.
            c) Source current.
        2) 10-0V reverse analog voltage signal.
        3) DSI digital communication.
        4) DALI broadcast communication IEC 60929:
            d) Logarithmic intensity values in compliance with IEC 60929.
            e) Linear intensity values for use with LED color intensity control.
        5) PWM IEC 60929.

H. Non-dim circuits to meet the following requirements:
1. Rated life of relay at full load: Minimum 1,000,000 cycles.
2. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
3. Fully rated output continuous duty for inductive, capacitive, and resistive loads.

2.04 POWER PANELS

1. Basis-of-Design Product: Subject to compliance with requirements, provide Power Panels by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:
    a. Product: LCP128 SpecGrade panel.

B. Mechanical:
1. Listed to UL 508as industrial control equipment.
2. Delivered and installed as a UL listed factory assembled panel.
3. Field wiring accessible from front of panel without need to remove dimmer assemblies or other components.
4. Panels passively cooled via free-convection, unaided by fans or other means.
5. Ship panels with each dimmer in mechanical bypass position by means of jumper bar inserted between input and load terminals. Jumpers to carry full rated load current and be reusable at any time. Mechanical bypass device to allow for switching operation of connected load with dimmer removed by means of circuit breaker.

C. Electrical:
1. Panels contain branch circuit protection for each input circuit unless the panel is a dedicated feed-through type panel or otherwise indicated on the drawings.
2. Branch circuit breakers; meet following performance requirements:
    a. Listed to UL 489 as molded case circuit breaker for use on lighting circuits.
    b. Contain visual trip indicator; rated at 10,000 AIC, 120 V Dimming.
    c. Thermal-magnetic construction for overload, short-circuit, and over-temperature protection. Use of breakers without thermal protection requires dimmers/relays to have integral thermal

protection to prevent failures when overloaded or ambient temperature is above rating of panel.

d. Accept tag-out/lock-out devices to secure circuit breakers in off position when servicing loads.

e. Replaceable without moving or replacing dimmer/relay assemblies or other components in panel. UL listed as switch duty (SWD) so that loads can be switched on and off by breakers.

3. Mounting: Flush into wall

4. Utilize multiple load type 16A feed continuous-use UL listed dimming/switching modules.

5. For switching only circuits, utilize 1,000,000 cycle relay.

6. Utilize multiple load type low voltage dimming module.

D. LCD Panel Processor:

1. Basis-of-Design Product: Subject to compliance with requirements, provide LCD Panel Processor by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:

2. Separate password protection for installer and end user system settings.

3. Language selection: English.

4. Integral contact closure inputs.

5. Programming and system operation:

a. Control stations, control interfaces, and contact closure devices:

1) Assign functionality of each control station button, infrared interface, key switch, or contact closure input:

a) Raise/lower one, some, or all lighting zones
b) Raise/stop/lower one, some, or all motorized zones
c) Toggle one, some, or all lighting zones
d) Select/Toggle scene
e) Raise/Lower scene
f) Enable/Disable time clock
g) Initiate delay to off

2) AV rack mounted interface: [RS232 interface] [Ethernet interface]

3) Contact closure output: Momentary, maintained, or toggle.

4) DMX512 input: Maps DMX channel to a zone

b. Time clock

1) Integral astronomical time clock

a) Selectable geographic location (city or latitude/longitude).
b) Selectable time zone.
c) Selectable date and time format.
d) Adjustable starting and ending of daylight savings time.
e) Schedule adjustable to add, copy, modify, view, and delete events.

2) Assign functionality to time clock events:

a) Select global scene
b) Select customized scene
c) Enable/Disable all control stations (keypads)
d) Initiate delay to off
e) Enable/disable after hours mode

c. Emergency Mode

1) Automatic activation of predefined output intensities.

2) Disable control stations and time clock events.

3) Restore previous output intensities, enable control stations, and enable time clock events after deactivation of emergency mode.

d. After-hours Mode

1) User defined sequence is initiated by a time clock event to automatically turn specified outputs off:

a) 5 minutes before switching off, system to flash dimmed/switched outputs [3] times to warn occupants.

b) Shut off sequence can be delayed by button press or occupancy sensor override for 30 minutes.

c) Repeat shut off sequence after the delay period.

e. Global Scene: Set and recall scene programming for multiple wall station locations.

f. Overrides:

1) Set output levels to On, Off, 0-100 percent, or Flash

2) Select global scenes

3) Enable/disable time clock

4) Enable/disable all control stations

5) Enable/disable after-hours

E. Diagnostics and Service:

1. Replacing dimmer/relay does not require re-programming of system or processor.

2. Dimmers/relays: Include diagnostic LED's to verify proper operation and assist in system troubleshooting.

3. Dimming/relay panels: Include tiered control scheme for dealing with component failure that minimizes loss of control for occupant.

a. If lighting control system fails, lights to remain at current level. Panel processor provides local control of lights until system is repaired.

b. If panel processor fails, lights to remain at current level. Circuit breakers can be used to turn lights off or to full light output, allowing non-dim control of lights until panel processor is repaired.

2.05 POWER INTERFACES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Power Interface by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:

B. Electrical:

1. Phase independent of control input.

2. Dimmer to meet limited short circuit test as defined in UL 508.

C. Diagnostics and Service: Replacing power interface does not require re-programming of system or processor.

2.06 LOW-VOLTAGE WALL STATIONS

A. Basis-of-Design Product: Subject to compliance with requirements, provide "seeTouch" Low-Voltage Wall Stations by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:

B. Electronics:

1. Use RS485 wiring for low voltage communication.

C. Functionality:

1. Upon button press, LEDs to immediately illuminate.
2. LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or the LEDs turn off if the button press was not processed.
3. Allow for easy reprogramming without replacing unit.
4. Replacement of units does not require reprogramming.

D. Color:

1. Match NEMA WD1, Section 2.
2. Color variation in same product family: Maximum ΔE=1, CIE L*a*b color units.
3. Visible parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D 4674. Provide proof of testing upon request.

E. Provide faceplates with concealed mounting hardware.

F. Engrave wall stations with appropriate button, zone, and scene engraving descriptions furnished prior to fabrication.

2.07 LOW VOLTAGE CONTROL INTERFACES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Contact Closure Interface Model "OMX-IO", Contact Closure Input Interface Model "seeTouch keypads SO-xx" by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:

1. The contact closure input device shall accept both momentary and maintained contact closures.
2. The contact closure output device shall be able to be configured for maintained or momentary outputs.
3. The contact closure input device shall accept both momentary and maintained contact closures.

B. Contact Closure Output Interface:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Contact Closure Output Interface Model "OMX-CCO-8" by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:
    a. The contact closure output device shall able to be configured for maintained or momentary outputs.

C. Ethernet Integration:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Ethernet Interfaces; Model "OMX-CI-NWK-E" by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:
2. Provide ability to communicate by means of user-supplied PC or digital audiovisual equipment.
3. Provide access to:
    a. Scene selections.
    b. Fade dimmed output to a level.
    c. Ability to flash output levels.
    d. Enable/disable time clock.
    e. Enable/disable individual wall station.
    f. Simulate wall station button press.
    g. Fine tuning of light levels with individual output raise/lower.

h. Setting of time and date.

4. Provide status monitoring through button feedback and scene-status updates.

2.08 ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following accessories by Lutron Electronics Co., Inc., or comparable product by one of the listed approved manufacturers:

1. Emergency Lighting Interface; Lutron "LUT-ELI".

a. Provides total system listing to UL 924 when used with Lutron "LCP128" system.

b. Senses all three phases of building power.

c. Provides an output to power panels if power on any phase fails.

d. Accepts a contact closure input from a fire alarm control panel.

B. Tamper Proof Covers:

1. Locking covers for preset control units and wall stations: Reversible to allow lock to be located on either side of control.

2. Compatible with IR controls.

3. Does not reduce specified IR range by more than 50 percent of its original specification.

2.09 SOURCE QUALITY CONTROL

A. Perform full-function testing on 100 percent of all system components and panel assemblies at the factory.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's installation instructions.

B. Provide complete installation of system in accordance with Contract Documents.

C. Define each dimmer's/relay's load type, assign each load to a zone, and set control functions.

D. Provide equipment at locations and in quantities indicated on drawings. Provide any additional equipment required to provide control intent.

3.02 FIELD QUALITY CONTROL

A. Startup and Programming

1. Provide telephone startup assistance to Electrical Contractor or End User Representative (when available, in accordance with manufacturer's guidelines. Otherwise, onsite startup will be utilized.)

2. Provides access to a Factory Certified Telephone Startup Technician during normal business hours.

3. Provides telephone instruction and guidance for a complete system functional test.

4. With phone startup completion and End User Registration, the 1-year parts-only warranty will be upgraded to the Standard 2-year Warranty.

5. Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation under following parameters:

a. Qualifications for factory-certified field service engineer:

1) Minimum experience of 2 years training in the electrical/electronic field.

2) Certified by the equipment manufacturer on the system installed.

b. Make a visit upon completion of installation of central dimming control system:

1) Verify connection of power feeds and load circuits.
2) Verify connection and location of controls.
3) Verify proper connection of panel links (low voltage/data) and address panel.
4) Check dimming/switching panel load types and currents and remove by-pass jumpers.
5) Verify system operation control by control, circuit by circuit.
6) Verify proper operation of supplied interfacing equipment to other devices.
7) Obtain sign-off on system functions.
8) User to be trained on system operation.

3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain Lighting Control devices.

1. Train Owner's maintenance personnel on procedures and schedules for maintaining system.
2. Review data in maintenance manuals
3. Schedule training with Owner, through Owner’s representative, with at least seven days' advance notice.

END OF SECTION

SECTION 26 24 00 - SWITCHBOARDS AND PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service And Distribution Switchboards Rated 600 V And Less.
2. Panelboards, Overcurrent Protective Devices, And Associated Auxiliary Equipment Rated 600 V And Less For The Following Types:
   a. Lighting And Appliance Branch-Circuit Panelboards.
   b. Distribution Panelboards.

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE) Publications:

1. C57.13 “IEEE Standard Requirements for Instrument Transformers”

C. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”
2. AB 1 “Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures”
3. EI 21.1, “Instrument Transformers for Revenue Metering (110 kV BIL and less)”
4. FU 1 “Low Voltage Cartridge Fuses”
5. PB 1 “Panelboards”
6. PB 1.1 “General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less”
7. PB 2 “Deadfront Distribution Switchboards”
8. PB 2.1 “General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less”

D. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

E. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use With Copper Conductors”

F. International Electrical Testing Association Publications:

1. NETA ATS “Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPDT: Single pole, double throw.

F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data:

a. For each type of switchboard, panelboard, overcurrent protective device, TVSS device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

2. Shop Drawings: For each switchboard, panelboard and related equipment.

a. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

1) Enclosure types and details for types other than NEMA 250, Type 1.

2) Bus configuration, current, and voltage ratings.

3) Short-circuit current rating of switchboards and overcurrent protective devices.

4) Descriptive documentation of optional barriers specified for electrical insulation and isolation.

5) Utility company's metering provisions with indication of approval by utility company.

6) UL listing for series rating of installed devices.

7) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

b. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

4. Field Test Reports: Submit written test reports in accordance with NETA ATS and include the following:

a. Test procedures used.

b. Test results that comply with requirements.

c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

5. Manufacturer's field service report.

6. Maintenance Data: For switchboards and components to include in maintenance manuals specified in Division 01. In addition to requirements specified in Division 01 Section "Contract Closeout," include the following:

a. Routine maintenance requirements for switchboards and all installed components.

b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

c. Time-current curves, including selectable ranges for each type of overcurrent protective device.

7. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

8. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 01. In addition to requirements specified in Division 01 Section "Contract Closeout," include the following:

    a. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

    b. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

    1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

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 NEMA PB 2 for switchboards.

D. Comply with NEMA PB1 for panelboards.

E. Comply with NFPA 70.

F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards, including clearances between switchboards, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in sections of lengths that can be moved past obstructions in delivery path.

B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. Handle switchboards according to NEMA PB 2.1.

1.7 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations: Rate equipment for continuous operation under the following, unless otherwise indicated:

    1. Ambient Temperature: Not exceeding 104 deg F.

    2. Altitude: Not exceeding 6600 feet.

1.8 COORDINATION

A. Coordinate layout and installation of switchboards, panelboards, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

PART 2 PRODUCT

2.1 SWITCHBOARDS

A. Approved Manufacturers:

1. Eaton Corp.; Cutler-Hamer Products (800-498-2678)
2. General Electric Co.; Electrical Distribution & Control Div. (888-437-3765)
3. Siemens Energy & Automation, Inc. (800-964-4114)
4. Square D Co.; a Division of Groupe Schneider (888-778-2733)

B. Manufactured Units:

1. Front-Connected, Front-Accessible Switchboard Fixed, individually mounted main device, panel-mounted branches, and sections rear aligned.
2. Nominal System Voltage: 208 Y/120 V.
3. Main-Bus Continuous: As indicated on the Contract Drawings.

C. Switchboard Short-Circuit Rating:

1. Fully rated to interrupt symmetrical short-circuit current available at terminals.
2. Short circuit ratings as indicated on the drawings.

D. Instrumentation:

1. Instrument Transformers: NEMA EI 21.1, IEEE C57.13, and the following:
   a. Current Transformers: Ratios shall be as indicated with accuracy class and burden suitable for connected relays, meters, and instruments.
2. Digital Multi-meter: Face mounted capable of providing:
   a. Volts L-L (all three phases)
   b. Volts L-N (all three phases)
   c. Current (all three phases)
   d. Kilowatts
   e. Power Factor
3. As manufactured by Shark Series 200 or equal.

E. Fabrication and Features:

1. Enclosure: Steel: NEMA 250, Type 1.
2. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.
3. Barriers: Between adjacent switchboard sections.
4. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. If separate vertical section is required for utility metering, match and align with basic switchboard.
5. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.
6. Hinged Front Panels: Allow access to circuit-breaker, metering, accessory, and blank compartments.
7. Buses and Connections: Three phase, four wire, unless otherwise indicated. Include the following features:
   a. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity.

1) Copper bus, use copper for feeder circuit-breaker line connections.

b. Ground Bus: 1/4-by-2-inch minimum size, drawn-temper copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

c. Contact Surfaces of Buses: Silver plated.

d. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.

e. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

f. Neutral Buses: 100 percent of the ampacity of the phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus is braced.

8. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 PANELBOARDS

A. Approved Manufacturers:

1. Eaton Corp.; Cutler-Hammer Products (800-498-2678)
2. General Electric Co.; Electrical Distribution & Control Div. (888-437-3765)
3. Siemens Energy & Automation, Inc. (800-864-4114)
4. Square D Co.; a Division of Groupe Schneider (888-778-2733)

B. Panelboard Short-Circuit Rating:

1. Fully rated to interrupt symmetrical short-circuit current available at terminals.
2. Short circuit ratings as indicated on the drawings.

C. Lighting And Appliance Branch-Circuit Panelboards:

1. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.
2. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike with hinged dead front cover.

D. Distribution Panelboards:

1. Doors: Front mounted, except omit in fused-switch panelboards; secured with vault-type latch with tumbler lock; keyed alike with hinged dead front cover.
2. Main Overcurrent Protective Devices: Circuit breaker.
3. Branch overcurrent protective devices shall be one of the following:

a. For Circuit-Breaker Frame Sizes 125 A and Smaller: Plug-in circuit breakers.

b. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

E. Fabrication And Features:

1. Enclosures: Flush- and/or surface-mounted cabinets as indicated on drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.

b. Kitchen Areas: NEMA 250, Type 4X, stainless steel.

c. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

3. Hinged Dead Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

4. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

5. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.

6. Bus: Hard-drawn copper, 98 percent conductivity or tin-plated aluminum.

7. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.

8. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

9. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

10. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

11. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.

12. Gutter Barrier: Arrange to isolate individual panel sections.

13. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 OVERCURRENT PROTECTIVE DEVICES - SWITCHBOARD AND PANELBOARDS

A. Approved Manufacturers:

1. Eaton Corp.; Cutler-Hammer Products (800-498-2678)

2. General Electric Co.; Electrical Distribution & Control Div. (888-437-3765)

3. Siemens Energy & Automation, Inc. (800-864-4114)

4. Square D Co.; a Division of Groupe Schneider (888-778-2733)

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger. Adjustable time-current settings for circuit-breaker frame sizes over 400 A.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

a. Instantaneous trip.

b. Long- and short-time pickup levels.

c. Long- and short-time time adjustments.

d. Ground-fault pickup level, time delay, and I^2t response.

4. GFCI Circuit Breakers: Single- and two-pole configurations with 5 -mA trip sensitivity.

C. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.

2.4 IDENTIFICATION

A. Presentation Media: Painted graphics in color contrasting with equipment factory-finished background to represent bus and components, complete with lettered designations.

PART 3 EXECUTION

3.1 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

3.2 EXAMINATION

A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.

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

3.3 INSTALLATION

A. Install switchboards and accessories according to NEMA PB 2.1.

B. Install panelboards and accessories according to NEMA PB 1.1

C. Support switchboards on concrete bases, 4-inch nominal thickness.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Mounting of Panelboards: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

G. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing. Use a computer or typewriter to create directory and encapsulate in plastic, handwritten directories are not acceptable.

H. Install filler plates in unused spaces.

I. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

J. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

3.4 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 05 53 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.5 CONNECTIONS

A. Install equipment grounding connections for switchboards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Testing: After installing switchboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Infrared Scanning: Switchboard only. After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panel so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

3. Record of Infrared Scanning: Prepare a certified report that identifies switchboards checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Balancing Loads: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes as follows:

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data-processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

E. Test Reports: Compile all test results in accordance with NETA ATS and submit to Owner.

3.7 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges in accordance with approved coordination study.

3.8 CLEANING

A. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 24 00 (16440)

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles
2. Connectors
3. Switches
4. Finish Plates

1.2 REFERENCES

A. National Electrical Manufacturer's Association (NEMA) Standards Publications:

1. WD 1 "General Color Requirements for Wiring Devices"
2. WD 6 "Wiring Devices—Dimensional Requirements"

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

C. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors"
2. 486B "Standard for Wire Connectors for Use with Aluminum Conductors"

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 01.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described in Division 01 Section that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

PART 2 PRODUCTS

2.1 RECEPTACLES

A. Approved Manufacturers:

1. Leviton Manufacturing Co., Inc. (718-229-4040).
2. GE Company; GE Wiring Devices (401-886-6200)
3. Hubbell, Inc.; Wiring Devices Div. (203-882-4900)
4. Killark Electric Manufacturing Co. (314-531-0460)
5. Pass & Seymour/Legrand; Wiring Devices Div. (800-223-4185)

B. Straight Blade and Locking Type Receptacles: Commercial grade, NEMA 5-20R duplex type.

C. GFCI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.

D. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap.

1. Devices: Listed and labeled as isolated-ground receptacles.
2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.2 PENDANT CORD/CONNECTOR DEVICES

A. Approved Manufacturers:

1. Leviton Manufacturing Co., Inc. (718-229-4040).
2. GE Company; GE Wiring Devices (401-886-6200)
3. Hubbell, Inc.; Wiring Devices Div. (203-882-4900)
4. Killark Electric Manufacturing Co. (314-531-0460)
5. Pass & Seymour/Legrand; Wiring Devices Div. (800-223-4185)

B. Description: Matching, locking type, plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.3 CORD AND PLUG SETS

A. Approved Manufacturers:

1. Leviton Manufacturing Co., Inc. (718-229-4040).
2. GE Company; GE Wiring Devices (401-886-6200)
3. Hubbell, Inc.; Wiring Devices Div. (203-882-4900)
4. Killark Electric Manufacturing Co. (314-531-0460)
5. Pass & Seymour/Legrand; Wiring Devices Div. (800-223-4185)

B. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.

2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

A. Approved Manufacturers:

1. Leviton Manufacturing Co., Inc. (718-229-4040).

2. Lutron Electronics Company, Inc (888-LUTRON1)

3. Pass & Seymour/Legrand; Wiring Devices Div. (800-223-4185)

B. Snap Switches: General-duty, quiet type.

C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.

2. Receptacle: NEMA WD 6, Configuration 5-20R.

D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible and electromagnetic noise filters.

1. Control: Continuously adjustable slide. Single-pole or three-way switch to suit connections.

2. LED Dimmers: Modular, 120 V, 60 Hz with continuously adjustable slide; single pole with soft tap or other quiet switch; electromagnetic filter to eliminate noise, RF, and TV interference; and 5-inch wire connecting leads.

3. Color:

a. Color of devices shall match cover plates.

2.5 WALL PLATES

A. Approved Manufacturers:

1. Leviton Manufacturing Co., Inc. (718-229-4040).

2. Lutron Electronics Company, Inc (888-LUTRON1)

3. Pass & Seymour/Legrand; Wiring Devices Div. (800-223-4185)

B. Single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Provide plates for all devices and outlets with opening configuration suitable for devices to be covered.

3. Plates shall be smooth urea plastic secured in place with screws finished to match the plates. Back of the house areas, such as equipment spaces, shall have steel plates. Stainless steel plates shall be used in kitchens. Weatherproof plates shall be used where exposed to the weather or in pool area.

4. Color:

a. As selected by Owner's Representative

b. Color of devices shall match cover plates.

2.6 FLOOR SERVICE FITTINGS

A. Approved Manufacturers:

1. Hubbell, Inc.; Wiring Devices Div. (203-882-4900)
2. Pass & Seymour/Legrand; Wiring Devices Div. (800-223-4185)
3. Square D Co.; a Division of Groupe Schneider (888-778-2733)
4. Wiremold. (800-621-0049)

B. Type: Modular, flush-type, dual-service units suitable for wiring method used.

C. Compartmentation: Barrier separates power and signal compartments.

D. Housing Material: Die-cast aluminum, satin finished.

E. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.

F. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

2.7 MULTIOUTLET ASSEMBLIES

A. Approved Manufacturers:

1. Airey-Thompson Co. (800-421-61969)
2. Wiremold (800-621-0049)

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish.

D. Wire: No. 12 AWG.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Protect devices and assemblies during painting. Install wall plates when painting is complete.

C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer. Dimmer switches shall be provided for all circuits with dimming fixtures shown. Dimmers shall be installed in a location directed by the Owner, in a location not visible to guests.

D. Do not share neutral conductor on load side of dimmers.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

F. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Section 26 05 53 - "Identification for Electrical Systems."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 26 27 26

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Individually Mounted Switches And Circuit Breakers Used For The Following:

a. Motor Disconnect Switches.

1.2 REFERENCES

A. National Electrical Manufacturer's Association (NEMA) Publications:

1. KS 1 "Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)"

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

C. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors"

2. 486B "Standard for Wire Connectors for Use with Aluminum Conductors"

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data: Descriptive data,

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide disconnect switches specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

A. Approved Manufacturers:

1. General Electric Co.; Electrical Distribution and Control Division (888-437-3765)

2. Siemens Energy & Automation, Inc. (800-964-4114)

3. Square D Co.; a Division of Groupe Schneider (888-778-2733)

4. Eaton Corp. Cutler-Hammer Products (800-498-2678)

B. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

C. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.

D. Enclosure: NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3R.

2. Kitchen Areas: Type 4X, stainless steel.

3. Other Wet or Damp Indoor Locations: Type 4.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install disconnect switches in locations as indicated, according to manufacturer's written instructions.

B. Install disconnect switches level and plumb.

C. Install wiring between disconnect switches and indication devices.

D. Connect disconnect switches and components to wiring system and to ground as indicated and instructed by manufacturer.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Identify each disconnect switch and circuit breaker according to requirements specified in Section 26 05 53 - "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

A. Testing: After installing disconnect switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect.

B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION 26 28 16

SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. AC Motor-Control Devices Rated 600 V And Less That Are Supplied As Enclosed Units.

1.2 REFERENCES

A. National Electrical Manufacturer's Association (NEMA) Publications:

1. 250 "Enclosures for Electrical Equipment (1000 Volts Maximum)"
2. AB 1 "Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures"
3. ICS 2 "Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 6000 Volts"
4. KS 1 "Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)"
5. MG 1 "Motors and Generators"

B. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

C. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A "Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors"

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
2. Maintenance Data: For products to include in the maintenance manuals specified in Division 01.
3. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
4. Qualification Data for Field Testing Agency: Certificates, signed by Contractor, certifying that agency complies with requirements specified in "Quality Assurance" Article below.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer.

B. Comply with NFPA 70.

C. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.5 COORDINATION

A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

1.6 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described in Division 01 Section that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. ABB Power Distribution, Inc.; ABB Control, Inc. Subsidiary (888-385-1221)
2. Allen-Bradley Co.; Industrial Control Group (414-382-2000)
3. Crouse-Hinds ECM.; Cooper Industries, Inc. Div. (315-477-5531)
4. Eaton Corp.; Westinghouse & Cutler-Hammer Products (800-386-1911)
5. General Electric Co.; Electrical Distribution & Control Div. (888-437-3765)
6. Siemens Energy & Automation, Inc. (800-964-4114)
7. Square D Co.; a Division of Groupe Schneider (888-778-2733)

2.2 ENCLOSED TIMER SWITCHES

A. Timer switch for spa: Spring wound 0 to 30 minutes, by Tork or Intermatic.

2.3 MANUAL MOTOR CONTROLLERS

A. Description: NEMA ICS 2, general purpose, Class A with toggle action and overload element.

2.4 MAGNETIC MOTOR CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.

B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise indicated. Include a control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Combination Controller: Factory-assembled combination controller and disconnect switch with or without overcurrent protection as indicated.

1. Circuit-Breaker Disconnect: NEMA AB 1, motor-circuit protector with field-adjustable short-circuit trip coordinated with motor locked-rotor amperes.

D. Overload Relay: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of specific motor to which they connect, and with appropriate adjustment for duty cycle.

2.5 VARIABLE-FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, variable-frequency controller, listed and labeled as a complete unit and arranged to provide variable speed of a standard NEMA MG 1, Design B, 3-phase, induction motor by adjusting output voltage and frequency.

B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

C. Output Rating: 3-phase, 6 to 66 Hz, with torque constant as speed changes.

D. Starting Torque: 100 percent of rated torque or as indicated.

E. Speed Regulation: Plus or minus one percent.

F. Ambient Temperature: 0 to 40 deg C.

G. Efficiency: 95 percent minimum at full load and 60 Hz.

H. Isolated control interface allows controller to follow 1 of the following over an 11:1 speed range:

1. Electrical Signal: 4 to 20 mA at 24 V.

I. Internal Adjustability: Include the following internal adjustment capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 2 to 22 seconds.
4. Deceleration: 2 to 22 seconds.
5. Current Limit: 50 to 110 percent of maximum rating.

J. Self-protection and reliability features include the following:

1. Motor Overload Relay: Adjustable and capable of NEMA 250, Class 10 performance.
2. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
3. Instantaneous overcurrent trip.
4. Loss of phase protection.
5. Reverse phase protection.
6. Under- and overvoltage trips.
7. Overtemperature trip.
8. Short-circuit protection.

K. Automatic Reset/Restart: Attempt 3 restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Restarting during deceleration will not damage controller, motor, or load.

L. Status Lights: Door-mounted LED indicators to indicate the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

M. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

N. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate controller output current, voltage, and frequency.

O. Integral disconnect.

2.6 ENCLOSURES

A. Description: Flush or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 3R.

2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.

3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.7 ACCESSORIES

A. Devices are factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Stop and Lockout Push-Button Station: Momentary-break push-button station with a factory-applied hasp arranged so a padlock can be used to lock push button in depressed position with control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

E. Elapsed Time Meters: Heavy duty with digital readout in hours.

F. Phase-Failure and Undervoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connection. Provide adjustable undervoltage setting.

G. Impulse sparkover voltage coordinated with system circuit voltage.

H. Factory mounted with Nationally Recognized Testing Laboratory listed and labeled mounting device.

PART 3 EXECUTION

3.1 APPLICATIONS

A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Use fractional-horsepower manual controllers for single-phase motors, unless otherwise indicated.

D. Use manual controllers for 3-phase motors up to 7-1/2 hp not requiring automatic or remote control.

E. Push-Button Stations: In covers of magnetic controllers for manually started motors where indicated, start contact connected in parallel with sealing auxiliary contact for low-voltage protection.

F. Hand-Off-Automatic Selector Switches: In covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment.

3.2 INSTALLATION

A. Install independently mounted motor-control devices according to manufacturer's written instructions.

B. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components, including the pretesting and adjustment of solid-state controllers.

C. Location: Locate controllers within sight of motors controlled.

D. For control equipment at walls, bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks conforming to Section 26 05 00 - "Common Work Results for Electrical."

E. Install freestanding equipment on concrete housekeeping bases conforming to Section 03 30 00 - "Cast-in-Place Concrete."

3.3 IDENTIFICATION

A. Identify motor-control components and control wiring according to Section 26 05 53 "Electrical Identification."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor-control devices according to Section 26 05 19 “Low-Voltage Electrical Power Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic control devices where available.

1. Connect selector switches to bypass only the manual and automatic control devices that have no safety functions when switch is in the hand position.

2. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.

2. Remove and replace malfunctioning units with new units, and retest.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

3.8 DEMONSTRATION

A. Training: Engage a factory-authorized service representative to demonstrate solid-state and variable-speed controllers and train Owner's maintenance personnel.

1. Conduct training as specified in Division 01 Sections.

2. Include training relating to equipment operation and maintenance procedures.

END OF SECTION 26 29 13

SECTION 26 41 13 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Lightning Protection System for Buildings and Associated Structures

B. Related Sections:

1. Section 26 05 00 (16050) – Common Work Results for Electrical
2. Section 26 05 26 (16060) - Grounding and Bonding for Electrical Systems

1.02 REFERENCES

A. Lightning Protection Institute (LPI) Publications:

1. 175 “Standard Practice for the Design – Installation – Inspection of Lightning Protection Systems”
2. 177 “Inspection Guide for Certified Systems”

B. Occupational Safety & Health Administration (OSHA) Regulations:

1. 1910.7 “Definition and Requirements for a Nationally Recognized Testing Laboratory”

C. Underwriter's Laboratories, Inc. (UL) Standards:

1. 96A “Standard for Installation Requirements for Lightning Protection Systems”

1.03 SYSTEM DESCRIPTION

A. Lightning Protection System to protect entire building.

1.04 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data:

1. Product Data for each component specified. Include the following:
2. Shop Drawings detailing lightning protection system. Include air terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway and data on how concealment requirements will be met.
3. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by nationally recognized testing laboratory (NRTL) or trade association. Include lists of completed projects with project names and addresses, names and addresses of owner's representative and owners, and other information specified.
4. Certification, signed by Contractor, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.
5. Field inspection reports indicating compliance with specified requirements.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who is NRTL listed or who is certified by the Lightning Protection Institute as a Master Installer/Designer.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Provide UL Master Label.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:

1. Approved Lightning Protection Co., Inc. (631-643-6327)
2. Harger Lightning Protection, Inc. (800-842-7437)
3. Heary Bros. Lightning Protection Co. (800-421-6141)
4. Independent Protection Co., Inc. (800-860-8388)
5. Robbins Lightning, Inc. (800-426-3792)
6. Thompson Lightning Protection Co. (651-455-7661)

2.02 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96.

B. System Materials: Copper, with solid air terminals, except as otherwise indicated.

C. Air Terminals for Single-Ply Membrane Roof Mounting: Units with bases especially designed for single-ply membrane roof materials.

D. Air Terminals for Main Stack: Stainless steel.

E. Ground Rods: Copper-clad steel with a minimum of 27 percent of rod weight in copper cladding.

1. Diameter: 3/4 inch
2. Length: 10 feet

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces, areas, and conditions, with Installer present, for compliance with installation tolerances and other conditions affecting performance of lightning protection. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install lightning protection as indicated, according to manufacturer's written instructions.

B. Comply with UL 96A and LPI-175.

C. Conform to the most stringent requirements when more than one standard is specified.

D. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops. Where indicated, run conductors in nonmetallic raceway, Schedule 40, minimum.

E. Conceal system conductors.

F. Conceal down conductors.

G. Conceal interior conductors.

H. Provide notification to Owner's Representative a minimum of 48 hours prior to concealing lightning protection components.

I. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components except those above single-ply membrane roofing.

J. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's installation instructions.

K. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.

L. Bond ground terminals to counterpoise conductor.

M. Bond grounded metal bodies on building within 12 feet of ground to counterpoise conductor.

N. Bond grounded metal bodies on building within 12 feet of roof to counterpoise conductor.

O. Bond lightning protection components to grounded metal bodies on building at every 60 feet with intermediate-level interconnection loop conductors.

3.03 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.

B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.04 FIELD QUALITY CONTROL

A. Periodic Inspections: Provide the services of a qualified inspector to perform periodic inspections during construction and at its completion, according to LPI-177.

B. UL Inspection: Apply for inspection by UL as required for UL master labeling of system.

END OF SECTION

SECTION 26 43 13 - SURGE PROTECTION FOR LOW VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Transient Voltage Surge Suppressors for Low-Voltage Power, Control, and Communication Equipment.

a. Service Entrance Suppressors

b. Plug-In Surge Suppressors

c. Control And Data Terminals

d. Enclosures

B. Related Sections:

1. Section 26 24 00 (16440) – Switchboards and Panelboards

2. Section 26 24 26 (16140) - Wiring Devices

1.02 REFERENCES

A. Institute of Electrical and Electronics Engineers (IEEE) Publications:

1. C62.41 “Surge Voltages In Low-Voltage AC Power Circuits”

2. C62.45, "IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits”

B. InterNational Electrical Testing Association (NICET)

C. National Electrical Manufacturer’s Association (NEMA) Standards Publications:

1. 250 “Enclosures for Electrical Equipment (1000 Volts Maximum)”

2. WD 6 “Wiring Devices—Dimensional Requirements”

D. National Institute for Certification in Engineering Technologies (NETA)

1. ATS “Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems”

E. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

F. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors”

2. 486B “Standard for Wire Connectors for Use with Aluminum Conductors”

3. 1283 “Electromagnetic Interference Filters”

4. 1449 “Transient Voltage Surge Suppressors”

1.03 SUBMITTALS

A. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in Project and with the following supporting data:

1. Product Certificates: Signed by manufacturers of transient voltage suppression devices, certifying that products furnished comply with the following testing and labeling requirements:

a. UL 1283 certification.

b. UL 1449 listing and classification.

2. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:

a. Test procedures used.

b. Test results that comply with requirements.

c. Failed test results and corrective action taken to achieve requirements.

3. Maintenance Data: For transient voltage suppression devices to include in maintenance manuals specified in Division 01.

4. Warranties: Special warranties specified in this Section.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

C. Product Options: Drawings indicate size, dimensional requirements, and electrical performance of suppressors and are based on the specific system indicated.

D. 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.

E. IEEE Compliance: Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide for Surge Suppressor Testing."

F. UL Compliance: Comply with UL 1283, "Electromagnetic Interference Filters," and UL 1449, third edition, "Transient Voltage Surge Suppressors."

1.05 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect service entrance equipment to their sources until the surge protective devices are installed and connected.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner representative not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Owner’s representative written permission.

C. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.

2. Operating Temperature: 30 to 120 deg F.

3. Humidity: 0 to 85 percent, non-condensing.

4. Altitude: Less than 20,000 feet above sea level.

1.06 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

1.07 WARRANTY

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

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of surge suppressors that fail in materials or workmanship within Five (5) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers:

1. Broad Line of Suppressors:

a. Current Technology, Inc. (800-238-5000)

b. Liebert Corp. (614-888-0246)

c. Square D Co.; a Division of Group Schneider (888-778-2733)

2. Category A and Telephone/Data Line Suppressors:

a. MCG Electronics, Inc. (800-851-1508)

b. NTE Electronics, Inc. (973-748-5089)

c. Telebyte Technology, Inc. (800-835-3298)

2.02 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protective Device Description: Modular design with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.

2. Fabrication using bolted compression lugs for internal wiring.

3. Integral disconnect switch.

4. Redundant suppression circuits.

5. Redundant replaceable modules.

6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.

7. Red and green LED indicator lights for power and protection status.

8. Audible alarm, with silencing switch, to indicate when protection has failed.

9. One set of dry contacts rated at 5 a and 250-V ac, for remote monitoring of protection status. Coordinate with building power monitoring and control system.

10. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: 160 kA per phase.

C. Connection Means: Permanently wired.

D. Protection modes and UL 1449, third edition, clamping voltage for grounded wye circuits with voltages of 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: 700 V for 208Y/120.

2. Line to Ground: 700 V for 208Y/120.

3. Neutral to Ground: 700 V for 208Y/120.

2.03 PLUG-IN SURGE SUPPRESSORS

A. Description: Non-modular, plug-in suppressors with at least four 15-A, 120-V ac, NEMA WD 6, Configuration 15-15R receptacles, suitable to plug into a NEMA WD 6, Configuration 15-15R receptacle; with the following features and accessories:

1. LED indicator lights for power and protection status.
2. LED indicator lights for reverse polarity and open outlet ground.
3. Circuit breaker and thermal fusing. Unit continues to supply power if protection is lost.
4. Close-coupled direct plug-in.
5. Rocker-type on-off switch, illuminated when in the on position.
6. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and 4.

B. Peak Single-Impulse Surge Current Rating: 26kA per phase.

C. Protection modes and UL 1449 clamping voltage shall be as follows:

1. Line to Neutral: 475 V.
2. Line to Ground: 475 V.
3. Neutral to Ground: 475 V.

2.04 CONTROL AND DATA TERMINALS

A. Protectors for copper control, data, antenna and telephone conductors entering the building from the outside shall be as recommended by the manufacturer for the type of line being protected.

2.05 ENCLOSURES

A. NEMA 250, with type matching the enclosure of panel or device being protected.

PART 3 EXECUTION

3.01 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multi-pole, 15-A circuit breaker as a dedicated disconnect for the suppressor, unless otherwise indicated.

3.02 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with requirements.
2. Complete startup checks according to manufacturer's written instructions.
3. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 07.19. Certify compliance with test parameters.

B. Repair or replace malfunctioning units. Retest after repairs or replacements are made.

3.04 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain surge protective devices.

1. Train Owner's maintenance personnel on procedures and schedules for maintaining suppressors.

2. Review data in maintenance manuals. Refer to Section 01 78 23 (01830) - "Operation and Maintenance Data."

3. Schedule training with Owner, through Owner representative, with at least seven days' advance notice.

END OF SECTION

Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
B01		Recessed Box	Eaton - Metalux	22CZ-LD5-39-UNV-L835-CD1-U	24"L x 24"W x 3.25"H	2x2 Lensed "Cruze" Center Basket Troffer *Finish: white *Trim: white *Reflector: *Lens: Ribbed Acrylic frosted	Recessed ACT	No 0-10V	* LED-I * 3500K * 85+ * 3932	60,000 Hrs	* Qty = * *	* 36.4W * 120-277V	Public Space, BOH	GM Office/Sales Office /Break room/Guest Laundry/workroom
B01		Recessed Box	PHILIPS DAY-BRITE	2EVG38L835-2-D-UNV-DIM	23.75"L x 23.75"W x 2.75"H	2x2 EVOGRID LED *Finish: white *Trim: white *Reflector: *Lens: Ribbed Acrylic frosted	Recessed ACT	NO 0-10V	* LED * 3500K * 80 * 3800	50000	* Qty = * *	* 33.3W * 120-277V	BOH/Public	GM Office/Sales Office /Break room/Guest Laundry/workroom
B06		Recessed Box	Eaton - Metalux	24GR-LD5-72-F1-UNV-L835-CD1-U	24"L x 48"W x 3.25"H	2x4 Recessed Lensed Troffer. A12 Shielding *Finish: white *Trim: white *Reflector: *Lens: Acrylic Prismatic Frosted Lens	Recessed ACT	No 0-10V	* LED-I * 3500K * 85+ * 7203	60,000 Hrs	* Qty = * *	* 54.2W * 120-277V	BOH	Laundry/Food Prep
B06		Recessed Box	PHILIPS DAY-BRITE	2TG74L835-4-FA-02F-UNV-DIM	24"L x 48"W x 3"H	2x4 T-Grid Recessed LED Lensed Troffer *Finish: white *Trim: white *Reflector: *Lens: Acrylic Prismatic Frosted Lens	Recessed ACT	NO 0-10V	* LED-I * 3500K * 80 * 7142	50000	* Qty = * *	* 74.1W * 120-277V	BOH	Laundry/Food Prep
B07		Recessed Box	Eaton - Metalux	22GR-LD5-43-F1-UNV-L835-CD1-U	24"L x 24"W x 3.25"H	2x2 Recessed Troffer *Finish: white *Trim: white *Reflector: *Lens: Acrylic Prismatic Frosted Lens	Recessed ACT	No 0-10V	* LED-I * 3500K * 85+ * 4360	60,000 Hrs	* Qty = * *	* 40.1W * 120-277V	BOH	Food Prep
B07		Recessed Box	PHILIPS DAY-BRITE	2TG45L835-2-FS-02F-UNV-DIM	24"L x 24"W x 3"H	2x2 T-Grid LED Recessed Troffer *Finish: white *Trim: white *Reflector: *Lens: acrylic diffuse	Recessed ACT	NO 0-10V	* LED * 3500K * 80 * 4551	50000	* Qty = * *	* 51.5W * 120-277V	BOH	Food Prep
B10		Recessed Box	Eaton - Metalux	24GR-LD4-48-F1-UNV-L835-CD1-U	47 3/4"L x 23 3/4"W x 3 1/4"H	2X4 Recessed Troffer *Finish: white *Trim: white *Reflector: *Lens: Acrylic Prismatic Frosted Lens	Recessed ACT	No 0-10V	* LED * 3500K * 85+ * 4799	60,000 Hrs	* Qty = * *	* 34.9W * 120-277V	BOH	Luggage/Comp/Telecom
B10		Recessed Box	PHILIPS DAY-BRITE	2TG52L835-4-FS-02F-UNV-DIM	48"L x 24"W x 3"H	T-Grid 2X4 General LED Troffer *Finish: white *Trim: white *Reflector: *Lens: Acrylic Prismatic Frosted Lens	Recessed ACT	NO 0-10V	* LED * 3500K * 80 * 5179	50000	* Qty = * *	* 49.3W * 120-277V	BOH	Luggage/Comp/Telecom
B14		Linear Channel	Tech Lighting LLC, a Generation Brands Company	RLS3MISCA0016Include the following:* Linear Channel - QTY: (1) RLS3MISCA0016*Gimbel Spot - QTY (5): RLS3G8303W* Transformer - QTY (1): 700AT300T	96.3"L x 6.32"W x 5.64"H	Recessed "Merge" Linear Channel - 8' Long w/Gimbal 30 deg beam spread spot heads w/ no LED lamps inside. "Merge". Linear Box is acting as a power for Gimbal spots only. *Finish: white *Trim: Flangeless *Reflector: white *Lens: white	Flangeless Recessed Gyp	Yes ELV	* LED-I * 3000K * 80 * 836/Hd	35,000 Hrs	* Qty = * *	* 9.3/HdW * 120V	Public	Crate

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
B20		Linear Box Light	Eaton - Neoray	S122RDRP-S485D930-GYP0F0-1-UDD--W Custom run - to be provided at quotation. Ceiling type, Length run to inch", width run to ". 4 corners - rectangular run approximately 21'x10'. Outside edge wall, recessed perimeter slot 2"	X" L x 2" W (2.68" ID/4" OD) x 4" H	2" Wide "Define Series" linear box 3' length, damp listed *Finish: Satin *Trim: White Flange *Reflector: *Lens: Flat Lens	Recessed Wall Perimeter	Yes 0-10V	* LED * 3000K * 85+ * 485 LPF	50000	* Qty = * *	* 4.7W/fW * 120/277V	Public Space	Interior Media Pods recessed perimeter edge
B21		8' Recessed Slot	Eaton - Metalux	8RCG-4-78D-L935-U	4"W x 95.75" L x 4.125" H	Recessed linear slot, 8' x 4" wide lensed *Finish: White Trim White Flange *Trim: Lensed *Reflector: *Lens: Frost Flush Lens	Recessed	Yes 0-10V	* LED * 3500K * 90+ * 6200	50000 Hrs	* Qty = * *	* 52.8W * 120/277V	Public Space	Fitness Linear
C03		Controls	Eaton Cooper	For more information refer to Light Fixture Product Manual and Project Manual Master Section 26 09 33. Required, not optional.		Mtg Room Dimmer and keypad. (To be separate from Centralized System) *Finish: *Trim: *Reflector: *Lens:		N/A	* * * * N/A	N/A	* Qty = * *	* W * V	Public	Meeting Room
C03		Controls	Lutron Electronics Co., Inc.	For more information refer to Light Fixture Product Manual and Project Manual Master Section 26 09 33. Required, not optional.		Mtg Room Dimmer and keypad. (To be separate from Centralized System) *Finish: *Trim: *Reflector: *Lens:		N/A	* * * * N/A	N/A	* Qty = * *	* W * V	Public	Meeting Room
C04		Controls	Eaton Cooper	For more information refer to Light Fixture Product Manual and Project Manual Master Section 26 09 33. (Required, not optional, in accordance with Design Guideline Drawings).		Centralized Dimming System. (Note: Refer to Separate System descriptions for Fitness Room and Meeting Room - NOT to be included in Centralized System) *Finish: *Trim: *Reflector: *Lens:		N/A	* * * * N/A	N/A	* Qty = * *	* W * V	Public	General Lighing - Controls(Refer to Design Guideline Systems Criteria Drawing) Lobby
C05		Controls	Eaton Cooper	For more information refer to Light Fixture Product Manual and Project Manual Master Section 26 09 33. Required, not optional.		Fitness Center Room Controller (To be separate from Centralized System. Lights to be controlled with occupancy sensors to provide 50% dimming when unoccupied.) *Finish: *Trim: *Reflector: *Lens:		N/A	* * * * N/A		* Qty = * *	* W * V	Public	Fitness Room

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Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
C10		Controls	Eaton- Halo	WP1-Wall Plug: MAR-HWP1BLE40ABL (qty.2) WP2-Wall Plug: MAR-HWP1BLE40AWH (qty.2) SD1-Smart Dimmer: MAR-HIWMA1BLE40ABL (qty.1) SD2-Smart Dimmer: MAR-HIWMA1BLE40AWH (qty.1) SKA1-Keypad: MAR-HIWSKA1BLE40ABL(qty.1) SKB1-Keypad: MAR-HIWSKA1BLE40ABL(qty.1)		Dimming control package contains items & opts listed under Model No. Wall keypads & smart dimmers, order decora faceplate separately. Faceplate & device color to match; Black: dark color walls & White: light color walls. Refer to Dwgs for device qtys *Finish: *Trim: *Reflector: *Lens:		YES	* * * *		* Qty = * *	* W * 120V	Guestroom	Standard King, King Mod, QQ Inline Suite, Accessible QQ Inline Suite
C11		Controls	Eaton- Halo	WP1-Wall Plug: MAR-HWP1BLE40ABL (qty.3) WP2-Wall Plug: MAR-HWP1BLE40AWH (qty.2) SD1-Smart Dim: MAR-HIWMA1BLE40ABL(qty.1) SD2-Smart Dim: MAR-HIWMA1BLE40AWH (qty.1) SKA1-Keypad: MAR-HIWSKA1BLE40ABL (qty.1) SKB1-Keypad: MAR-HIWSKA1BLE40ABL (qty.1)		Dimming control package contains items & opts listed under Model No. Wall keypads & smart dimmers, order decora faceplate separately. Faceplate & device color to match; Black: dark color walls & White: light color walls. Refer to Dwgs for device qtys *Finish: *Trim: *Reflector: *Lens:		YES	* * * *		* Qty = * *	* W * 120V	Guestroom	Accessible King
C12		Controls	Eaton- Halo	WP1-Wall: MAR-HWP1BLE40ABL (qty.2) WP2-Wall: MAR-HWP1BLE40AWH (qty.2) SD1-Dim: MAR-HIWMA1BLE40ABL (qty.1) SD2-Dim: MAR-HIWMA1BLE40AWH (qty.3) SKA1: MAR-HIWSKA1BLE40ABL (qty.1) SKA2: MAR-HIWSKA1BLE40AWH (qty.1) SKB1: MAR-HIWSKA1BLE40ABL (qty.1)		Dimming control package contains items & opts listed under Model No. Wall keypads & smart dimmers, order decora faceplate separately. Faceplate & device color to match; Black: dark color walls & White: light color walls. Refer to Dwgs for device qtys *Finish: *Trim: *Reflector: *Lens:		YES	* * * *		* Qty = * *	* W * 120V	Guestroom	King Suite
C13		Controls	Eaton- Halo	WP1 - Wall Plug: MAR-HWP1BLE40ABL (qty.2) WP2 - Wall Plug: MAR-HWP1BLE40AWH (qty.1) SD1 - Smart Dimmer: MAR-HIWMA1BLE40ABL (qty.1) SD2 - Smart Dimmer: MAR-HIWMA1BLE40AWH (qty.1) SKA1 - Keypad: MAR-HIWSKA1BLE40ABL (qty.2)		Dimming control package contains items & opts listed under Model No. Wall keypads & smart dimmers, order decora faceplate separately. Faceplate & device color to match; Black: dark color walls & White: light color walls. Refer to Dwgs for device qtys *Finish: *Trim: *Reflector: *Lens:		YES	* * * *		* Qty = * *	* W * 120V	Guestroom	Standard QQ

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

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C14		Controls	Eaton- Halo	WP1-Wall Plug: MAR-HWP1BLE40ABL (qty.2) WP2-Wall Plug: MAR-HWP1BLE40AWH (qty.1) SD1-Smart Dim: MAR-HIWMA1BLE40ABL (qty.1) SD2-Smart Dim: MAR-HIWMA1BLE40AWH (qty.1) SKA1-Keypad: MAR-HIWSKA1BLE40ABL (qty.1) SKB1-Keypad: MAR-HIWSKA1BLE40ABL (qty.1)		Dimming control package contains items & opts listed under Model No. Wall keypads & smart dimmers, order decora faceplate separately. Faceplate & device color to match; Black: dark color walls & White: light color walls. Refer to Dwgs for device qtys *Finish: *Trim: *Reflector: *Lens:		YES	* * * *		* Qty = * *	* W * 120V	Guestroom	Accessible QQ
D162A	ED-400	Strip Light	Van Teal Inc	4183	30" L x 4.25" D x 3" H	Decorative vanity light with metal brushed nickel body *Finish: metal brushed nickel body *Trim: *Reflector: *Lens:	Wall	No	* Fluorescent * 3000K * 85 * 1269		* Qty = 2 * MI# 113647 * F14WT5	* 28W * 110V	Back of House	Empolyee Restroom
D197	PR-400/ PR-400B	Vanity Light	Illumination Lighting	TBD	42"Wx7.5"Dx10"H	Vanity Light *Finish: Hydropaint Faux Wood "G" *Trim: N/A *Reflector: N/A *Lens: Satin opal glass	wall	yes	* LED 5W G9 WA-G9-5.0W-001-2790-D) (BY OTHERS) * 3000K * * 535 X2		* Qty = * *	* 10WW * 120V	Public Space e	Women's Restroom
D198	PR-401/ PR-401B	Vanity Light	Illumination Lighting	TBD	TBD	Vanity Light *Finish: Hydropaint Faux Wood "G" *Trim: N/A *Reflector: N/A *Lens: Satin opal glass	wall	yes	* LED 5W G9 WA-G9-5.0W-001-2790-D) (BY OTHERS) * 3000K * * 535 X2		* Qty = * *	* 10WW * 120V	Public Space	Men's Restroom
D308	PG-402	Corridor Sconce	Challenger Lighting	SA5990-00A	4 1/4"W x 4"D x 24"H	Decorative Corridor Sconce, hardwired, UL approved fixture, estimated weight: 4 Lbs. *Finish: PLATED BRUSHED NICKEL *Trim: N/A *Reflector: N/A *Lens: 4x20x2 3/4 FROSTED WHITE ACRYLIC	WALL	YES 120-277V	* INTEGRATED MAXLIGHT LED * 3000K * * 1070	50,000 Hrs	* Qty = * *	* 17W * 120V	Guestroom Corridors	
D308	PG-402	Corridor Sconce	Illumination Lighting	D-8927-10	4 1/4"W x 3 7/8"D x 24"H	Decorative Corridor Sconce, hardwired, UL approved fixture, estimated weight: 4 Lbs. *Finish: PLATED BRUSHED NICKEL *Trim: N/A *Reflector: N/A *Lens: 4x20x2 3/4 FROSTED WHITE ACRYLIC	WALL	YES 120-277V	* INTEGRATED MAXLIGHT LED * 3000K * * 1070	50,000 Hrs	* Qty = * *	* 17W * 120V	Guestroom Corridors	

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Gen 6.5 - New Build - Inspired Classic

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D310	X-402	Sconce	Challenger Lighting	SA4630-00 RETRO/ GU24 (1)	10"W x 4"D x 12"H	Decorative Guestroom Entry Sconce, hardwired, UL approved fixture *Finish: PLATED BRUSHED NICKEL *Trim: N/A *Reflector: N/A *Lens: HALF SHADE (4:10) (4:!0)x 12 - OPAL FROSTED ARCYLIC	WALL	NO N/A	* LED * 3000K * *		* Qty = * *	* 10W * 120V	Guestrooms	
D310	X-402B	Sconce - Bulb	Challenger Lighting	TCPLED10A19GUDOD30K	N/A	Decorative Guestroom Entry Sconce - LED Bulb *Finish: N/A *Trim: N/A *Reflector: N/A *Lens: N/A	N/A	N/A N/A	* LED * 3000K * *		* Qty = * *	* 10W * 120V	Guestrooms	
D313ALT1	X-417ALT1	Vanity Mirror with Light Decorative	Majestic Mirror	TBD	36" Dia	Round Mirror with perimter LED light *Finish: Brushed Nickel *Trim: N/A *Reflector: N/A *Lens: N/A	Wall	NO N/A	* LED * 3000K * *		* Qty = * *	* 75W * V	Guestroom	Bathroom
D313ALT2	X-417ALT2	Vanity Mirror with Light Decorative	Majestic Mirror	TBD	54"x64"	Rectangular Mirror with perimter LED light *Finish: Brushed Nickel *Trim: N/A *Reflector: N/A *Lens: N/A	Wall	NO N/A	* LED * 3000K * *		* Qty = * *	* 75W * V	Guestroom	Bathroom
D316	LM-401	Pendant @ Media Pod	Illumination Lighting	TBD	38"Wx29"Dx48"H	Decorative Pendant @ Media Pod *Finish: Brushed Nickel/ Black Laquered *Trim: N/A *Reflector: N/A *Lens: Satin opal acrylic	Ceiling	yes	* Integral LED * 3000K * *		* Qty = * *	* 30W * 120V	Public Space	Media Pod Pendants
D317	LM-402/ LM-402B	Pendant @ Window	Illumination Lighting	TBD	12 3/16"Wx12 3/16"Dx48"H	Decorative Pendant @ Window *Finish: Brushed Nickel *Trim: N/A *Reflector: N/A *Lens: Satin opal glass	Ceiling	yes	* LED - "A" TYPE DIMMABLE, MEDIUM BASE (BY OTHERS) * 3000K * *		* Qty = * *	* 10WW * 120V	Public Space	Pendant @ Window
D318	LM-405	Pendant @ Communal Table	Illumination Lighting	TBD	59"Wx4"Dx"Hx3 3/16"H	Decorative Pendant @ Communal Table *Finish: Brushed Nickel *Trim: N/A *Reflector: N/A *Lens: Satin opal acrylic	Ceiling	yes	* Integral LED * 3000K * *		* Qty = * *	* 19WW * 120V	Public Space	Pendant @ Communal Table/ Collaboration Area
D319	LM-406	Chandelier	Illumination Lighting	TBD	66"Wx48"Dx48"H	Decorative Chandelier *Finish: Exposed Metal:Brushed Nickel/ Wood: Accents *Trim: N/A *Reflector: N/A *Lens: Satin opal acrylic	Ceiling	yes	* Integral LED * 3000K * *		* Qty = * *	* 70W + 25W - 95WW * 120V	Public Space	Chandelier

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D320	LM-407/ LM-407B	Column Sconce	Illumination Lighting	TBD	6.25"Wx3.5"Dx16 .75"H	Decorative Column Sconce *Finish: Brushed Nickel/ Walnut Type-G *Trim: N/A *Reflector: N/A *Lens: Satin opal glass	Ceiling	yes	* LED 5W G9 EA-G9-5.0W-001-3090-D (BY OTHERS) * 3000K * *		* Qty = * *	* 5WW * 120V	Public Space	Lobby Sconce @ Columns
D321	LM-408 / LM-408B	Bistro Picture Light	Illumination Lighting	TBD	30"Wx9"Dx4.5"H	Decorative Bistro Picture Light *Finish: Brushed Nickel/ Black Satin *Trim: N/A *Reflector: N/A *Lens: Satin opal acrylic	Ceiling	yes	* LED (Satco S8756 (BY OTHERS) * 3000K SOFT WHITE * * 675		* Qty = * *	* 8W W * 120V	Public Space	Menu Board Sconce
D323	LM-500	Reception Artwork Light	Illumination Lighting	TBD	42"Wx7.5"Dx10"H	Welcome Pod Artwork (Connection to Place) South *Finish: Hydropaint Faux Wood "G" *Trim: N/A *Reflector: N/A *Lens: Clear frosted acrylic panel	wall	yes	* Integral LED * 3000K * *		* Qty = * *	* 43W +/-W * 120V	Public Space	Reception
J02A		Low Profile Undercabinet	Eaton - Halo	HU1024D930P	23.98"L x 4.37"W x .76"H	2' Undercabinet Strip w/Switch (connecting accessories available for connecting fixtures, see spec sheet) *Finish: White *Trim: White *Reflector: *Lens: Acrylic	Surface / Undercabinet	No Std Incandescent dimmer	* LED * 3000K * 90 * 660	50,000 Hrs	* Qty = * *	* W * 120V	BOH, Public Space	Work Room/Reception
J02B		Low Profile Undercabinet	Eaton - Halo	HU1036D930P	32.44"L x 4.37"W x .76"H	3' Undercabinet Strip w/Switch (connecting accessories available for connecting fixtures, see spec sheet) *Finish: White *Trim: White *Reflector: *Lens: Acrylic	Surface / Undercabinet	No Std Incandescent dimmer	* LED * 3000K * 90 * 990	50,000 Hrs	* Qty = * *	* W * 120V	BOH, Public Space	Work Room/Reception
J02C		Low Profile Undercabinet	Eaton - Halo	HU1048D930P	47.18"L x 4.37"W x .76"H	4' Undercabinet Strip w/Switch (connecting accessories available for connecting fixtures, see spec sheet) *Finish: White *Trim: White *Reflector: *Lens: Acrylic	Surface / Undercabinet	Yes Std Incandescent dimmer	* LED * 3000K * 90 * 1320	50,000 Hrs	* Qty = * *	* W * 120V	BOH, Public Space	Work Room/Reception
J05		Surface Mounted Wrap	Eaton - Metalux	4WNLED-LD4-40SL-FUNV-L835-CD1-U	48"L x 7 5/8"W x 1.5"H	4' - "WNLED" Surface Mounted Wrap *Finish: *Trim: *Reflector: *Lens: Acrylic	Surface or Stem (if stem - order kit separately)	Yes 0-10V	* LED * 3500K * 85+ * 4062	60,000 Hrs	* Qty = * *	* 36W * 120-277V	BOH	Electrical/Stor/ Maint/Linen Storage/Linen Chute/Eng. Office/ Storage/Mechanical Rm/Food Prep storage/Dryers

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
J05		Surface Mounted Wrap	PHILIPS DAY-BRITE	OWL440L835-UNV-DIM	48"L x 8 5/8"W x 2 11/16"H	OWL Wraparound LED Linear surface mount general illumination luminaire *Finish: ACRYLIC *Trim: *Reflector: *Lens:	Surface or Stem (if stem - order kit separately)	NO 0-10V	* LED * 3500K * 80 * 3933	50,000 HRS	* Qty = * *	* 37W * 120-277V	BOH	Electrical/Stor/Maint/Linen Storage/Linen Chute/Eng. Office/Storage/Mechanical Rm/Food Prep storage/Dryers
J09		Flexible Strip lighting	Volt Lighting Group	PH3K	0.40" (10 mm) x 0.05" (1.3mm) (Refer to drawings for required length)	High Output Linear Strip *Finish: *Trim: *Reflector: *Lens:	3M industrial adhesive backing	No	* LED * 3000K * TBD * 330/Ft.		* Qty = * *	* W * 12V DC/ Constant VoltageV	Public space	Elevator Lobby Wall (4-sided panel)
J09ALT		Flexible Strip lighting	Hafele	LED #01.1(1) LOOX Driver 833.74.913(1) 2m Primary Power Cable 833.89.003(2) flexible light strips 833.73.510(2) Interconnecting Leads w/clip for strip lights 833.73.721	Qty of flexible light strip varies per application area.	*Finish: *Trim: *Reflector: *Lens:	Various areas within Bar/Bistro front / Communal Table undermount / Lobby Wall feature	No	* LED * 3000K * TBD *	30,000 Hrs	* Qty = * *	* W * 12VV		Elevator Lobby Wall (4-sided panel)
J24a		Tape Light Assembly	Kichler	MODEL MS185820J24A 6TD24V40BK-DIM 40W Pwr Sup qty.2 10189WH-Splice Box qty.2 1TEC1STSFSIL-8' Tape Ext Channel qty.3 1TEM1STSFFML: Tape Ext Mounting Clips (Bags of 10) qty.2 8T1TWRSWH-Tape-to-wire/Supply Lead Con qty.2		Dimmable Tape Light assembly at light coves, one assembly per room. J24a, J24b and J24c all to be ordered together. *Finish: *Trim: *Reflector: *Lens:		N/A	* * * *		* Qty = * *	* W * V	Interior	All Guestrooms
J24b		Tape to Tape Connector	Kichler	MODEL MS8T1TTR1WH		8T_Rigid Tape to Tape Connector (Bag of 5 Connectors) (Qty 5 bags recommended for 125 Keys-confirm with Distributor). J24a, J24b and J24c all to be ordered together. *Finish: *Trim: *Reflector: *Lens:		N/A	* * * *		* Qty = * *	* W * V	Interior	All Guestrooms
J24c		Tape Light	Kichler	MODEL MS8T110030WH		8T_Tape Light 100' roll. Quantity and length take offs required for each project. Mount in channel provided in J24a. J24a, J24b and J24c all to be ordered together. *Finish: *Trim: *Reflector: *Lens:		N/A	* * * *		* Qty = * *	* W * V	Interior	All Guestrooms

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

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J27		Cove Light	Eaton - IO	LM-10L-930-120-ID-UNV-S-SM-ST-D-2F	24"L x 1.7" W x 1.8" H	Linear 2' with quick connects. CoviO. Bakcbar *Finish: Silver *Trim: Silver *Reflector: clear *Lens: 120 degrees	Surface	Yes 0-10V	* LED * 3000K * TBD * 1187/lf	50000 Hrs	* Qty = * *	* 9.4w/ftW * 120V	Public Space	Bar Back Wall
J28		Tape Light System	Kichler	MODEL MS185821J28 8T1010H30WH-8T Tape 10' qty.2 8T1001H30WH-8T Tape 1' 1TEK1DWRC8SIL-Ext Kit 1TEC1FLRC8SIL-Channel qty.2 1TELFL18WHO-Lens qty.2 1TEE1FLRCSSIL-End Cap 1PR qty.2 8T1TWR1WH-8T Tape-Wire Con qty.5 6TD24V40BKT-Dim 40W Pwr Sup qty.2		Dimmable tape light assembly. * Reference to Design Guideline Drawings for quantity, lengths, and locations. ** Reference "Fixture Model No" for pieces and parts. *Finish: *Trim: *Reflector: *Lens:	Surface Mount	YES	* IntegratedLED * 3000 * 90 * 200		* Qty = * *	* 56000W * 120V	Public Space	Bar Back Wall
J29		Tape Light System	Kichler	MODEL MS185821J29 8T1010H30WH-8T Tape 10' qty.3 1TEK1DWRC8SIL-Ext Kit qty.3 1TEK1DWRC2SIL-Ext Kit 10189WH-Box qty.2 8T1TWR1WH-8T Tape-Wire Con qty.5 8T1TWRSWH-8T Tape-Sup Con qty.2 8T1TTR1WH-8T Tape-Tape Con qty.5 6TD24V40BKT-Dim 40W Pwr Sup qty.2		Dimmable tape light assembly. * Reference to Design Guideline Drawings for quantity, lengths, and locations. ** Reference "Fixture Model No" for pieces and parts. *Finish: *Trim: *Reflector: *Lens:	Surface Mount	YES	* IntegratedLED * 3000 * 90 * 200		* Qty = * *	* 56000W * 120V	Public Space	Bar Front
J30		Tape Light System	Kichler	MODEL MS185821J30 8T1010H30WH-8T Tape 10' qty.2 1TEK1DWRC8SIL-Ext Kit qty.3 1TEE1DWRCSSIL-Ext End Cap (5 Pair) 10189WH-Splice Box qty.2 8T1TWRSWH-8T Tape-Sup Con qty.2 8T1TWR1WH-8T Tape-Wire Con qty.5 6TD24V40BKT-Dim 40W Pwr Sup qty.2		Dimmable tape light assembly. * Reference to Design Guideline Drawings for quantity, lengths, and locations. ** Reference "Fixture Model No" for pieces and parts. *Finish: *Trim: *Reflector: *Lens:	Surface Mount	YES	* IntegratedLED * 3000 * 90 * 200		* Qty = * *	* 56000W * 120V	Public Space	Media Pods

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

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R70		Downlight	Eaton - Halo	H550ICAT/ML5609930/592H	10.5"L x 5.5"W x 7"H	ML 5" Downlight Recessed *Finish: *Trim: *Reflector: Haze *Lens:	recessed	No	* LED * 3000K * 90+ * 842		* Qty = * *	* 13.4W * 120-277V	Public	Employee RR
R70		Downlight	PHILIPS LIGHTOLIER	L5RAZ10UVA / L5R10930VA / L5RDD	11.625"Lx8"Wx3.375"H	Lytecaster LED 5" DOWNLIGHT RECESSED *Finish: *Trim: *Reflector: *Lens:	RECESSED	NO	* LED * 3000 * 90 * 845	50000	* Qty = * *	* 13W * 120-277V	Public	Employee RR
R86		Down Light - narrow flood	Eaton - Halo	ML4D09NFL930E-TL43R2GMWWB-H245ICAT	Housing: 8.5"L x 5.25"W x 3.5"H x 4.375"D	Recessed 4" Downlight with 2" small aperature, 25 deg narrow flood, wet listed *Finish: White Trim White Flange *Trim: matte White flange *Reflector: white lens frame *Lens: diffuse clear	Ceiling recessed	No Leading Edge Trailing Edge 120-277	* LED * 3000K * 90+ * 900	50000 Hrs	* Qty = * *	* 12.1W * 120/277V	Public Space	Corridor Door Pocket and Mens/Women's Restrooms
R87		Down Light	Eaton - Halo Commercial	PD615D010B-PDM6B-930-61VH	Housing: 13"L x 7.5"W x 7"H	Downlight 6" Apperature *Finish: Clear *Trim: Haze trim and Flange *Reflector: Clear *Lens:	Ceiling Recessed	yes 0-10V	* LED * 3000K * 90+ * 1235	50,000 Hrs	* Qty = * *	* 13.7W * 120/277V	Public	Stairwell/Ice dispenser (uppr flrs)
R87		Downlight	PHILIPS Lightolier	P6RD15NZ10UVB / P6RD930VB / P6RDCC	12.875"Lx7.5Wx4.5"H	LYTEPROFILE Downlight 6" Apperature *Finish: Comfort Clear *Trim: white *Reflector: Comfort Clear Aluminum *Lens:	recessed	Yes 0-10V	* LED * 3000 * 90 * 1412	50000	* Qty = * *	* 15.3W * 120-277V	Public	Stairwell/Ice dispenser (uppr flrs)
R87ALT1		Downlight Emergency	Eaton - Halo	PD615ED010-IEM-PDM6830-61VEMH	13"L x 7.5"W x 7"H (26"L with bar hangars)	6" Apperature Emergency DownLight *Finish: Clear *Trim: Haze Trim and Flange *Reflector: Clear *Lens:	Ceiling recessed	No N/A	* LED * 3000K * 80+ * 1452	50,000 Hrs	* Qty = * *	* 13.7W * 120-277V	Public	stairwell
R87ALT1		Downlight Emergency	Philips Lightolier	P6RD20NZ10UVBEM / P6RD830VB / P6RDCCP	12.875"Lx7.5Wx4.5"H	Lyteprofile LED 6" Emergency Light *Finish: Comfort Clear *Trim: Comfort Clear trim and flange *Reflector: Comfort Clear Aluminum *Lens:	Ceiling recessed	NO 0-10V	* LED * 3000K * 80 * 1907	50000	* Qty = * *	* 20.7W * 120-277V	Public	stairwell
R87ALT2		Surface Mount Downlight (For Block and Plank construction)	Eaton - Halo	PR8S15D010MW-PR8M12WDMW-3000K	3 1/2" H x 11 3/16" W	Downlight 8" Aperature - Surface Mount *Finish: White *Trim: White *Reflector: None *Lens: Clear	Surface	No 0-10V	* LED * 3000 * 82+ * 1591	50000	* Qty = * *	* 15W * 120/277V		Stairwell Block and Plank installations surface mount to JBOX. 10 Foot ceiling and below
R87ALT2		Surface Mount Downlight (For Block and Plank construction)	Philips Lightolier	S7R830K10	7"Lx7"Wx0.625"H	SlimSurface LED Surface Mounted Downlight to Jbox (use this oprion when EM generator circuit available for Stairwell Egress lighting) *Finish: WHITE *Trim: WHITE *Reflector: NONE *Lens: CLEAR	SURFACE	NO ELV/TRIAC	* LED * 3000 * 80 * 1000	50000	* Qty = * *	* 14W * 120V		Stairwell Block and Plank installations surface mount to JBOX. 10 Foot ceiling and below

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

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R87ALT3		Surface Mount direct indirect light	Eaton - Metalux	4SWLED-LD4-48HL-LW-UNV-L835-CD1-SVPD2 Order (1) ISHH-01 Per project for onsite configuration. 100% on occupancy, 50% unoccupied or to program to meet local code requirements.	52" L x 4 11/16" H x 4 1/2" W	Surface Mount stairwell light with integrated sensor. *Finish: White with Wide Distribution Lens *Trim: White *Reflector: Frosted Lens with Wide Distribution *Lens: Frosted	Wall Surface or Ceiling Surface	NO, drops to 50% when space unoccupied 0-10V	* LED * 3500K * 80+ * 4800	50,000 Hrs	* Qty = * *	* 43.3W * 120-277V	Public	Stairwell
R102		Downlight	Eaton - Halo	E550ICAT - ML5609930-592W	9 7/8" L x 6 3/4" H x 63/4" W	5" ML Downlight *Finish: White *Trim: White *Reflector: White *Lens:	Ceiling recessed	No	* LED * 3000K * 90 * 832	50000	* Qty = * *	* 9.4WW * 120-277V	Guestroom	Bath
R103		Downlight	Eaton - Halo	ML4D06SP930E-TL43R2GMWWB-H245ICAT	Housing: 8.5"L x 5.25"W x 3.5"H x 4.375"D	Recessed 3" downlight with Haze Trim White Flange *Finish: White Trim Black Oculus *Trim: White *Reflector: Black *Lens: Yes	Recessed	NO LE/TE	* LED * 3000K * 90+ * 600	50,000 Hrs	* Qty = * *	* 7W * V	Guestroom Corridors	Door Entry
R104		Down Light	Eaton - Halo	ML4D09NFL930E-TL43R2GMWWB-H245ICAT	Housing: 8.5"L x 5.25"W x 3.5"H x 4.375"D	Recessed 4" Downlight with 2" small aperature, 25 deg narrow flood, wet listed *Finish: *Trim: matte White flange *Reflector: white lens frame *Lens: diffuse clear	Millwork / Ceiling recessed	No Leading Edge Trailing Edge 120-277	* LED * 3000K * 90+ * 900	50,000 Hrs	* Qty = * *	* 12.1W * V	Guestroom Corridors	Door Drop
R105		Downlight	Eaton - Halo	ML4D09930E-TL43R2GGBBB-H245ICAT	Housing: 8.5"L x 5.25"W x 3.5"H x 4.375"D	Recessed 4" Downlight with 2" small aperature, 25 deg narrow flood, wet listed Lensed German Bronze Black *Finish: *Trim: German Bronze Flange *Reflector: Black Lens Frame *Lens: diffuse clear	Ceiling recessed	Yes Leading Edge Trailing Edge 120-277	* LED * 3000K * 90+ * 900	50,000 Hrs	* Qty = * *	* 12.1W * V	Guestrooms	Guest Vestibule
R106		Downlight	Eaton - Halo	ML4D09930E-TL45R6GMWWB-H245ICAT	Housing: 8.5"L x 5.25"W x 3.5"H x 4.375"D	Recessed 4" Downlight with 2" small aperature, 2wall wash, wet listed *Finish: *Trim: matte White flange *Reflector: white lens frame *Lens: diffuse clear wall wash	Ceiling recessed	Yes Leading Edge Trailing Edge 120-277	* LED * 3000K * 90+ * 900	50,000 Hrs	* Qty = * *	* 12.1W * V	Guestroom	Guest Shower
R107		Downlight	Eaton - Portfolio	LD6B40D010-EU6B30509035-6LBM1MW-HB26	5 7/8" H x 11 1/8" W x 11 15/16" L	Recessed 6" new construction *Finish: White Trim White Flange *Trim: White *Reflector: *Lens: None	Recessed	Yes 0-10V	* LED * 3500K * 90+ * 3000	50000 Hrs	* Qty = * *	* W * 120/277V	Public Space	Fitness Downlight
R108		Downlight	Eaton - Portfolio	LD4B10D010-EU4B10209030-4LBN2H-HB26	10"W x 14"Lx 5.41"H	Recessed 4" downlight with Haze Trim White Flange *Finish: Haze Trim, White Flange *Trim: Haze *Reflector: white *Lens: None	Recessed	NO 0-10V	* LED * 3000K * 90+ * 1000	50,000 Hrs	* Qty = * *	* 11W * 120/277V	Public Space	Corridor Center

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R109		Downlight	Eaton - Halo	ML4D09NFL930-TL43R2GMWBB-H245IC	Housing: 8.5"L x 5.25"W x 3.5"H x 4.375"D	Recessed 2" Pinhole lensed Black with hex cell louver *Finish: *Trim: matte black flange *Reflector: Black Lens Frame *Lens: diffuse clear	Ceiling Recessed	No Leading Edge Trailing Edge 120-277	* LED * 3000K * 90+ * 900	50000 Hrs	* Qty = * *	* 12.1W * 120/277V	Public Space	Bar
R110		Linear Box Light Wall Wash	Eaton - NeoRay	S122RDR-S485D930-GYP4F0-1-UDD-A-W	X" L x 2" W (2.68" ID/4" OD) x 4" H	Recessed Regressed Linear Slot 2" 4' wall wash asymmetric lens. For installation in Gyp ceiling. 500 lumens per foot, 300 Kelvin. *Finish: Satin *Trim: White Flange *Reflector: *Lens: Flat Lens	Recessed Wall Wash Asymmetric	Yes 0-10V	* LED * 3000K * 85+ * 485 LPF	50000 Hrs	* Qty = * *	* 4.7W/fW * 120/277V	Public Space	Crate Sign
R111		Downlight	Eaton - Halo	HL36A20WFL930-ED010ICAT-TL3PIN2GMWBB	10"W x 14"Lx 5.41"H	Recessed 3" pinhole White with Black Oculus for new construction *Finish: Matte White Black Oculus *Trim: White *Reflector: *Lens: None	Recessed	Yes ELV	* LED * 3000K * 90+ * 1400	50000 Hrs	* Qty = * *	* 19.5W * 120/277V	Public Space	Meeting-room over Bar Area
R112		Downlight	Eaton - Halo	HL36A20WFL930-ED010ICAT-TL3RHWF (Haze trim, white flange)	10"W x 14"Lx 5.41"H	Recessed 3" aperature haze trim white flange for new construction *Finish: Haze Trim, White Flange *Trim: Haze *Reflector: *Lens: None	Recessed	Yes 0-10V	* LED * 3000K * 90+ * 1400	50000 Hrs	* Qty = * *	* 19.5W * 120/277V	Public Space	Lobby, Meeting Room, Common Areas
X01		Exit / Emergency Light	Eaton - Surelites	CX7 (Includes Battery Backup) Select single, double sided options	8 1/4"H x 12 5/8"W x 2 1/4"D	Die Cast Aluminum Emergency Exit light sign with Battery Back up *Finish: *Trim: *Reflector: *Lens:	wall/ceiling	No	* LED/RED * * *		* Qty = * *	* 1W * 120/277V	Public	Exit
X01		Exit / Emergency Light	PHILIPS CHLORIDE	ER55L3WR	8.5"H x 12.8125"W x 1.75"D	Emergency Exit light sign with Battery Back up *Finish: *Trim: *Reflector: *Lens:		No N/A	* LED/RED * * *		* Qty = * *	* 3.08W * 120/277V	Public	Exit
X02		Exit	Eaton - Surelites	CX6 (No battery Backup)	8 1/4"H x 12 5/8"W x 2 1/4"D	Die Cast Aluminum Exit Sign - No Battery Backup *Finish: *Trim: *Reflector: *Lens:	wall/ceiling	No	* LED/RED * * *		* Qty = * *	* 1W * 120/277V	Public	Exit
X02		Exit	PHILIPS CHLORIDE	55L3WR	8.5"H x 12.8125"W x 1.75"D	LED Exit Sign No Battery Backup *Finish: *Trim: *Reflector: *Lens:	SURFACE	NO N/A	* LED/RED * * *		* Qty = * *	* 2.48W * 120/277V	Public	Exit
X03		Emergency Light	Eaton - Surelites	SEL25SD	4 3/4"H x 14"W x 1 3/4"D	2 Head emergency battery - white For use with X01 *Finish: *Trim: *Reflector: *Lens:	wall/ceiling	No	* LED/WHITE * * *		* Qty = * *	* W * 4.8VV	Public	"Exterior Courtyard"

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
X03		Emergency Light	PHILIPS CHLORIDE	VLLU2	4.25"H x 7.3125"W x 3.1875"D	2 Head emergency battery - white For use with X01 *Finish: *Trim: *Reflector: *Lens:	Surface Wall / Ceiling	No	* LED/WHITE * * *		* Qty = * *	* 0.7W * 3.6VV	Public	"Exterior Courtyard"
Z01		Flood	Eaton - Lumark	XTOR2B-N, XTORFLD-KNC	6 3/4" L x 5 3/4"W x 3 5/8"H	"Crosstour" with Landscape Flood Kit, knuckle mount *Finish: *Trim: *Reflector: *Lens:	Ground	No	* LED * 3000K * TBD * 1523	72,000 Hrs	* Qty = * *	* W * 120vV	Exterior	Exterior Courtyard / uplite trees @ site / uplite treees @ corners of property
Z28		Down Light	Eaton - Halo Commercial	PD610ED010-IEM-PDM6840-61VEMC	13"L x 7.5"W x 7"H (26"L with bar hangars)	Downlight 6" Recessed Emergency backup - Wet location *Finish: *Trim: clear *Reflector: *Lens:	Recessed	No N/A	* LED * 4000K * 80+ * 1223	50,000 Hrs	* Qty = * *	* 9.9W * 120/277V	Exterior	Kitchen exterior entrance
Z28		Downlight	PHILIPS Lightolier	P6RD10NZ10UVBEM / P6RD840VB / P6RDCCP	12.875"Lx7.5Wx4.5"H	Downlight 6" Recessed Emergency backup - Wet location *Finish: *Trim: clear *Reflector: *Lens:		NO 0-10V	* LED * 4000 * 80 * 1033	50000	* Qty = * *	* 10.2W * 120-277V	Exterior	Kitchen exterior entrance
Z61		Pole	Eaton - Lumark	SSS-5-A-25-S-F-M-1	25' Pole 5" Square, 0.120" Thickness	25' Pole Square Steel *Finish: Bronze *Trim: *Reflector: *Lens:		N/A	* * * *		* Qty = * *	* W * V	Exterior	Parking Lot
Z61		Pole	PHILIPS GARDCO	SSS25-5-11-D1-BRP; 3/4-18-3.75A/B2N-2W-1LW	25' Pole 5" Square, .120 Thickness	25' Pole Square Steel *Finish: Bronze *Trim: *Reflector: *Lens:		N/A	* * * *		* Qty = * *	* W * V	Exterior	parking lot
Z62		Pole Light	Eaton - Lumark	PRVS-A40-UNV-T4	26 13/16"L x 13 15/16" W x 2 3/4" H	"Prevail" Exterior Site Head, Type IV *Finish: Bronze *Trim: *Reflector: *Lens:	Pole Z61	Yes 0-10V	* LED * 4000K * 70 * 15157	60,000 Hrs	* Qty = * *	* 143W * 120/277V	Exterior	Parking Lot
Z62		Pole Light	PHILIPS GARDCO	ECF-S-48L-900-NW-G2-AR-4-UNV-DD-BZ	24.2"L x 13" W x 2.1" H	ECOFORM SITE HEAD TYPE IV BRONZE *Finish: bronze *Trim: *Reflector: *Lens:	POLE Z61	NO 0-10V	* LED * 4000K * 70 * 16795	60000	* Qty = * *	* 135W * 120-277V	Exterior	parking lot
Z68		Linear Box Light	Eaton - Neoray	S123-DRLO30GYP-0023-1-U-ED-4-B	23" L x 3" W (2.68" ID/4" OD) x 4" H	3" Wide "Define Series" linear box, 2' length, damp listed *Finish: Satin *Trim: Black Flange *Reflector: *Lens: Drop Lens	Recessed Gyp with Flange	Yes 0-10V	* LED * 3000K * 85+ * 870	60,000 Hrs	* Qty = * *	* 10W * 120/277V	Exterior	Exterior Loggia - side entrance
Z69		Linear Box Light - ER	Eaton - Neoray	S123-DRLO30GYP-0023-1-U-EDE-4-B	23" L x 3" W (2.68" ID/4" OD) x 4" H	3" Wide "Define Series" linear box 2' length, damp listed w/ emergency backup *Finish: Satin *Trim: Black Flange *Reflector: *Lens: Drop Lens	Recessed Gyp with Flange	Yes 0-10V	* LED * 3000K * 85+ * 870	60,000 Hrs	* Qty = * *	* 10W * 120/277V	Exterior	Exterior Loggia - side entrance Embackup

NOTE 1: Items with an ID X-Ref # are items purchased through Marriott's Procurement Division as FF&E items (Furniture, Fixture, Equipment) if this service is selected by Owner. Confirm with Owner whether to include these "decorative" but hardwired lighting fixtures in the scope of the General Contractor, or whether to remove if they are provided by Marriott Procurement Services.
NOTE 2: Mark Numbers followed by an "ALT" = Alternative supplier of fixture. Mark Numbers followed by an "OPT" = Optional Choice of fixture.
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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
Z70		Linear Box Light	Eaton - Neoray	S123-DRL030GYP-0035-1-U-ED-4-B	35" L x 3" W (2.68" ID/4" OD) x 4" H	3" Wide "Define Series" linear box 3' length, damp listed *Finish: Satin *Trim: Black Flange *Reflector: *Lens: Drop Lens	Recessed Gyp with Flange	Yes 0-10V	* LED * 3000K * 85+ * 1305	60,000 Hrs	* Qty = * *	* 15W * 120/277V	Exterior	Exterior Loggia - side entrance
Z72		Linear Box Light	Pinnacle Architectural Lighting	EV3-WET-30-6'-IND-FL-120-1C-BR	74 5/8" L x 4 3/4" D x 4 13/16" H	"EDGE Evolution 3" Recessed Linear with Satine Lens, wet listed (approx 6' long) *Finish: *Trim: *Reflector: *Lens: Satine Wet Lens	recessed	no	* LED * 3000K * TBD *		* Qty = * *	* W * 120V	Exterior	Exterior Loggia - under front overhang and back overhang, Building skin-front left- vertical app/Ext Back wall Loggia
Z73		Linear Box Light - ER	Pinnacle Architectural Lighting	EV3-WET-30-6-IND-FL-120-1B-BR/ (1) IOTA ILB-CP10 EMERGenCY PACK/CARDINAL T025-BR01	74 5/8" L x 4 3/4" D x 4 13/16" H	"EDGE Evolution 3" Recessed Linear with Satine Lens, wet listed (approx 6' long) w/Emergency back up *Finish: *Trim: *Reflector: *Lens:		No	* LED * 3000K * *		* Qty = * *	* W * V	Exterior	Exterior Loggia front and back entrance
Z74A		Linear Box Light	Pinnacle Architectural Lighting	EV3-WET-30-3-BOR-FL-120-1C-GR/CARDINAL C241-GR07 (1 qty)	39" L x 4 3/4" D x 4 13/16" H	"EDGE Evolution 3"- 3' Recessed Linear box with Satine Lens, wet listed *Finish: *Trim: *Reflector: *Lens: Satine Wet Lens	recessed	No	* LED * 3000K * TBD *		* Qty = * *	* W * 120V	Exterior	Exterior Building - Front entry-vertical application
Z74B		Linear Box Light	Pinnacle Architectural Lighting	EV3-WET-30-8-MOR-FL-120-1C-GR/CARDINAL C241-GR07 (3 qty)	98 3/8"L x 4 3/4" D x 4-13/16"H	"EDGE Evolution 3" - 8' Recessed Linear box with Satine Lens, wet listed *Finish: *Trim: *Reflector: *Lens: Satine Wet Lens	recessed	No	* LED * 3000K * TBD *		* Qty = * *	* W * 120V	Exterior	Exterior Building - Front entry-vertical application
Z74C		Linear Box Light	Pinnacle Architectural Lighting	EV3-WET-30-6-EOR-FL-120-1C-GR/CARDINAL C241-GR07 (3 qty)	74 5/8" L x 4 3/4" D x 4-13/16"H	"EDGE Evolution 3" - 6' Recessed Linear box with Satine Lens, wet listed *Finish: *Trim: *Reflector: *Lens: Satine Wet Lens	recessed	No	* LED * 3000K * TBD *		* Qty = * *	* W * 120V	Exterior	Exterior Building - Front entry-vertical application
Z75		Sconce	LBL	MI-XW564OPBZLEDHEW	15.5"H x 6"W x 3"D	outdoor sconce *Finish: *Trim: *Reflector: *Lens: opal glass cover	wall mounted	No	* LED * 3000K * TBD *		* Qty = * *	* W * 120V	Exterior	Back Bldg @ "Exterior Courtyard"
Z76		Step light	Philips Hadco	RSC2-N-K5-W-E	3 1/2"D x 9"W x 3-1/2"H	outdoor step light *Finish: Natural Bronze *Trim: *Reflector: *Lens: amber glass lens	recessed into wall	No	* LED * 5500K * TBD *	50,000 Hrs	* Qty = 3 * *	* 3W * 120V	Exterior	Exterior Courtyard Planter, wall, & firepit
Z86		Bollard	Philips Lumec	ULB100 30W16LED4K-R LEV3 120 DMG BRTX	7.75" Dia x 40"H	"SoleCity" Contemporaray single sided bollard *Finish: Bronze *Trim: NA *Reflector: NA *Lens:	Ground Anchor Plate	no 0-10V	* LED * 4000K * 70 * 1600	100,000 Hrs	* Qty = NA * NA * NA	* 27W * 120V	Exterior	Ext Courtyard

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Light Fixture Matrix

Courtyard by Marriott

Gen 6.5 - New Build - Inspired Classic

Universal Mark	I.D. X-Ref	Product Type	Manufacturer	Model No.	Size (L x W x H) Sconce (H x W x D)	Fixture Description	Mount	On Dimmer / Dimmer Type	* Lamp Category * Temp * CRI * Deliv Lumens	Lamp Life / Fixture Life (Hrs)	* Lamp Qty * Lamp Bulb / Base Type * Lamp Model No.	* Fixture Input Watts (Max) * Volts	Area	Location
Z88		Downlight	Pathway Lighting	Fixture: 4SQLBV7035KN/ Trim: 4SQLBVHAZPF	5.68" Dia x	"Coventry Arch Series" Recessed downlight *Finish: *Trim: *Reflector: *Lens:	recessed	No	* LED * 3000K * 7914 *	50,000 Hrs	* Qty = * *	* 82W * 120V	Exterior	Porte Cochere/3rd & 4th floor overhang
Z93		Linear Box Light - ER	Eaton - Neoray	S123-DRL030GYP-0035-1-U-EDE-4-B	35"L x 3"W (2.68"ID, 4"OD) x 4"H	"Define 3 Series" - 3' linear box with emergency backup, damp listed. *Finish: Satin *Trim: Black Flange *Reflector: *Lens: Drop Lens	Recessed Gyp with Flange	Yes 0-10V	* LED * 3000K * 85+ * 1305	60,000 Hrs	* Qty = * *	* 15W * 120-277V	Exterior	Exterior Loggia - side entrance

NOTE 1: Items with an ID X-Ref # are items purchased through Marriott's Procurement Division as FF&E items (Furniture, Fixture, Equipment) if this service is selected by Owner. Confirm with Owner whether to include these "decorative" but hardwired lighting fixtures in the scope of the General Contractor, or whether to remove if they are provided by Marriott Procurement Services.
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SECTION 26 51 00 INTERIOR LIGHTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior Lighting Fixtures
2. Lamps
3. Ballasts
4. Exit Signs
5. Emergency Lighting Units
6. Accessories

B. Related Sections:

1. Section 09 51 23 - Acoustical Tile Ceilings
2. Section 26 05 00 - Common Work Results For Electrical.
3. Section 26 56 00 - Exterior Lighting
4. Section 26 60 00 - Lighting Accessories: For programmable lighting control systems, time switches, additional photoelectric relays, power relays, and contactors.

1.02 REFERENCES

A. American National Standards Institute (ANSI) Publications:

1. C82.4 “Ballasts for High – Intensity – Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type)”

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE) Publications:

1. C62.41 “Surge Voltages in Low-Voltage AC Power Circuits”

C. Illuminating Engineering Society (IES) Publications:

1. LM-79 “Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products”
2. LM-80 “Approved Method: Measuring Lumen Maintenance of LED Light Sources”

D. National Fire Protection Association (NFPA) Publications:

1. NFPA 70 "National Electric Code"
2. NFPA 101 “Life Safety Code®”

E. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors”
2. 486B “Standard for Wire Connectors for Use with Aluminum Conductors”
3. 924 “Emergency Lighting and Power Equipment”

1.03 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Submit “Letter of Conformance” in accordance with Section 01 33 00 (01330) indicating specified items selected for use in project with the following supporting data.

1. For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:
   a. Dimensions of fixtures.
   b. Certified results of laboratory tests for fixtures and lamps for photometric performance.
   c. Emergency lighting unit battery and charger.
   d. Fluorescent and high-intensity-discharge ballasts.
   e. Types of lamps.
   f. Photometric data.

2. Dimming Ballast Compatibility Certificates: Signed by manufacturer of ballast certifying that ballasts are compatible with dimming systems and equipment with which they are used.
3. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
4. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 01.

1.04 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
B. Comply with NFPA 70.
C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.05 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.06 EXTRA MATERIALS

A. Furnish extra materials described in Section 01 78 43 (01790) "Spare Parts and Materials" that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 PRODUCTS

A. Approved Manufacturers:
1. Subject to compliance with requirements, provide the products indicated for each designation in the Light Fixture Matrix attached at the end of this Section.
2. 2nd Avenue Design (800-843-1602)
   a. Contact: Jan Zanger (800-544-4879)
3. 3Form, Inc. (800-726-0126)
4. Acclaim Lighting (706-868-5451)
5. Ashley Lighting Inc. (870-483-6184)
   a. Contact: Laurie Foster (870-483-6181)
6. B-K Lighting
   a. Contact: Kahn Wright (301-470-3282)
7. Broan-NuTone LLC (513-936-4200)
   a. Contact: Ron Greene (301-599-0101)
8. Challenger Lighting Company (847-717-4700)
   a. Contact: Peggy Hart (301-260-2161 x 13)
9. Continental Group (614-679-1201)
   a. Contact: Sean Snyder (614-679-1201)
10. Cree LED Lighting Solutionsm (919-287-7700)
    a. Contact: Mark Wanless (708-505-4227)
    b. To obtain special volume pricing and accuracy for Marriott projects, contact:
       1) Wiedenbach-Brown Co., Inc.
          Attn: Buck Buchanan (917-566-4848) or Christine Sturm (800-243-0043 x 353)
11. Electric Mirror LLC (425-776-4946)
    a. Contact: Doug Finefrock (425-776-4946)
12. ExceLine, a Philips Group Brand (800-334-2212)
    a. Contact: Kathleen Kenny (813-760-3421)
13. Forecast, a Philips Group Brand (847-622-0416)
    a. Contact: Kathleen Kenny (813-760-3421)

14. Hadco, a Philips Group Brand (800-331-4185)
    a. Contact: Kathleen Kenny (813-760-3421)
15. Insight Lighting Inc. (262.524.2010)
    a. Contact: Heather Reed (301-338-1116)
16. io LED Cooper Lighting (713-209-8400)
17. Kichler Lighting (866-558-5706)
    a. Contact: Peggy Hart (301-260-2161 x 13)
18. LBL Lighting, a Generation Brands Company (847-626-6304)
    a. Contact: Joe Krause (301-537-5808)
19. Lightolier, a Philips Group Brand (508-679-8131)
    a. Contact: Kathleen Kenny (813-760-3421)
20. Lithonia Lighting, Accuity Brands, Inc. (770-992-9000)
21. Lumark Lighting, Division of Cooper Industries Company (770-486-4800)
    a. Contact: Mike Larkin (301-953-2020 x 239)
22. Lukas Lighting (800-841-4011)
    a. Contact: Craig Corona (718-706-0595)
23. LUMAPRO
24. Lumiere, Division of Cooper Industries Company (770-486-4800)
25. iWORKS (LUDO Lamp) (323-278-8363)
    a. Contact: Michele Chan (323-278-8363)
26. Ledra, by Bruck Lighting Systems, Inc. (714-259-9959)
27. Lyte Poles Incorporated (586-774-5650)
    a. Contact: Kathleen Kenny (813-760-3421)
28. MaxLite (800-555-5629)
    a. Contact: Bill Masi (908-672-1665)
29. National Specialty Lighting, Inc. (800-527-2923)
30. Pacific Coast Lighting (800-709-9004)
    a. Contact: Christopher Bryan (800-905-7225)
31. Panasonic (866-292-7292)
    a. Contact: Angy Steiner (262-670-9822)
32. Lithonia Lighting, Accuity Brands, Inc. (510-845-2760)
33. Philips Color Kinetics
    a. Contact: Kathleen Kenny (813-760-3421)
34. Philips Lighting Company (800.555.0050)
    a. Contact: Kathleen Kenny (813-760-3421)
35. Progress Lighting (864.599.6000)
    a. Contact: Jason Bak (864-599-6133)
36. Project Light (877-688-9005)
    a. Contact: Sam Avny (561-847-0322)
37. Quoizel Lighting (631-273-2700)
    a. Contact: Hope Steen (843-574-3457)
38. Renaissance Lighting, Gotham Lighting, Accuity Brands, Inc. (800-315-4982)
    a. Contact: Troy Cook (540-342-1548)
39. Resolute, (206-343-9323)
    a. Contact: Holly Finn (206-452-1468)
40. RSA, a Cooper Lighting Brand (713-209-8400)

41. Scott Lamp Company (707-864-2066)
    a. Contact: Bruce Wowk (301-916-5588)
42. Stonco Lighting, a Philips Group Brand (800-334-2212)
    a. Contact: Kathleen Kenny (813-760-3421)
43. TCP, Inc. (800-324-1496)
    a. Contact: Scott Carroll (216-372-2736)
44. Tech Lighting, a Generation Brands Company (847-410-4400)
    a. Contact: To obtain special volume pricing and accuracy for Marriott projects, contact:
        1) Valley Lighting, Linthicum, MD (800-932-6012)
45. Translite Sonoma, a Philips Group Brand (707-996-6906)
    a. Contact: Kathleen Kenny (813-760-3421)
46. Trend Lighting, a McFadden Lighting Company (314 773-1340)
    a. Contact: Rob Bruck (626-480-8880)
47. Unilight (800-361-0472)
    a. Contact: Kim Swanson (301-523-0070)
48. Wide-Lite, a Philips Group Brand (512.392.5821)
    a. Contact: Kathleen Kenny (813-760-3421)
49. Approved Substitution.

2.02 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:
    1. White Surfaces: 85 percent.
    2. Specular Surfaces: 83 percent.
    3. Diffusing Specular Surfaces: 75 percent.
    4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.
    1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
    2. Lens Thickness: 0.125 inch minimum, unless greater thickness is indicated.

2.03 FLUORESCENT LAMP BALLASTS

A. General Requirements: Unless otherwise indicated, features include the following:
    1. Designed for type and quantity of lamps indicated at full light output.
    2. Total Harmonic Distortion Rating: Less than 20 percent.
    3. Sound Rating: A.

B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:
    1. Certified Ballast Manufacturer Certification: Indicated by label.
    2. Encapsulation: Without voids in potting compound.
    3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

C. Ballasts for Compact Lamps in Recessed Fixtures: Unless otherwise indicated, additional features include the following:

1. Type: Electronic fully encapsulated in potting compound.
2. Power Factor: 90 percent, minimum.
3. Operating Frequency: 20 kHz or higher.
4. Flicker: Less than 5 percent.
5. Lamp Current Crest Factor: Less than 1.7.
6. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.

D. Ballasts for Dimmer-Controlled Fixtures: Comply with general and fixture-related requirements above for electronic ballasts.

1. Compatibility: Certified by manufacturer for use with specific dimming system indicated for use with each dimming ballast.

E. Ballasts for Low-Temperature Environments: As follows:

1. Temperatures 0 Deg F Above: Electronic or electromagnetic type rated for 0 deg F starting temperature.
2. Temperatures Minus 20 Deg F and Above: Electromagnetic type designed for use with high-output lamps.

2.04 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

A. General: Comply with ANSI C82.4. Unless otherwise indicated, features include the following:

1. Type: Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
2. Operating Voltage: Match system voltage.
3. Minimum Starting Temperature: Minus 22 deg F for single lamp ballasts.
4. Normal Ambient Operating Temperature: 104 deg F
5. Open-circuit operation that will not reduce average life.
6. Auxiliary, Instant-on, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.

2.05 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:

1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.

B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

2.06 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

4. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

2.07 LED FIXTURES

A. Fixtures shall be UL or Intertek (ETL) Listed.

B. Drivers shall be capable of accepting the voltage indicated on the [schedule] [drawings] and capable of dimming if required. The driver shall meet the following requirements:

1. Class A Sound Rating
2. Total Harmonic Distortion of less than 20 percent.
3. Operating temperature between -40 degree Celsius and 40 degrees Celsius.
4. Driver shall not contain any Polychlorinated Biphenyl (PCB).

C. All LED fixtures shall be tested to IES LM-79 and IES LM-80 and meet the following:

1. Fixture Efficacy (Lumens per watt): 60 or greater.
2. Color Accuracy: Color Rendering Index (CRI): 70 or greater.
3. Light Color: As indicated on lighting fixture schedule.
4. Outdoor fixtures shall be IP65 Rated.
5. LEDs, driver and all components shall have a system lifetime of 50,000 hours or more at 25 degrees Celsius.
6. Fixture shall have a minimum of a five year warranty on all components and finishes.

2.08 LAMPS

A. Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.

B. Non-compact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid-start circuits.

C. Metal-Halide Color Temperature and Minimum Color-Rendering Index: 3600 K and 70 CRI, unless otherwise indicated.

2.09 FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26/27 05 00 (16050) "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

D. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.10 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.
3. Colors as indicated in Light Fixture Matrix.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings:

1. Recessed lighting fixtures shall be supported independently from the suspended ceiling system. Number 8 gauge galvanized steel wire or approved type hangers from the overhead building structures shall be provided for fixture support.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.

3.02 CONNECTIONS

A. Ground Equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to battery source and retransfer to normal.
4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.04 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

Revision Log

SECTION 26 60 00 - LIGHTING ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Occupancy Sensors
2. Hearing Impaired Door Annunciator
3. Photoelectric Relays
4. Multipole Lighting Relays and Contactors

1.2 REFERENCES

A. American National Standards Institute (ANSI) Publications:

1. C62.41 “IEEE Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits”

B. National Electrical Manufacturer’s Association (NEMA) Publications:

1. ICS 2 “Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 6000 Volts”

C. National Fire Protection Association (NFPA) Publications:

1. 70 "National Electric Code"

D. Underwriter's Laboratories, Inc. (UL) Publications:

1. 486A “Standard For Wire Connectors and Soldering Lugs for Use with Copper Conductors”
2. 508 “Standard for Industrial Control Equipment”
3. 773A “Non-industrial Photoelectric Switches for Lighting Control”
4. 1449 “Transient Voltage Surge Suppressors”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:

1. Product Data:

a. Include dimensions and data on features, components, and ratings for lighting control devices.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions. Include coordination with the following:

1. Section 26 24 00 - "Switchboards and Panelboards."

PART 2 PRODUCTS

2.1 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Approved Manufacturers:

1. Occupancy Sensors:

a. Arrow Hart Wiring Devices (800-628-8956)

b. Bryant Electric (800-323-2792)

c. Honeywell, Inc.; Home and Building Controls (800-328-5111)

d. Hubbell Lighting, Inc. (864-599-6000)

e. Tork, Inc. (914-664-3542)

f. Watt Stopper, Inc. (The) (800-879-8585)

B. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

2.2 HEARING IMPAIRED DOOR ANNUNCIATOR.

A. Approved Manufacturers:

1. Edwards Signaling & Security Systems (800-336-4206)

B. Guestroom Door Annunciator Kit: Audible/visual signaling device with horn/strobe, hall push button station, and transformer. Minimum 82 dB sound pressure at 10 feet and a high intensity 110 candela visual signal.

1. "Model 7005-G5 Hotel Room Annunciator Kit"; Edwards Signaling & Security Systems

a. Kit consisting of the following components:

1) Model 6536-G5 Horn Strobe

2) Model 592 Transformer

3) Model 620 Push Button

4) (Do not use 147-10 Face Plate)

b. Model 147-1 Face Plate (No text on plate).

2. Locations as shown on Drawings.

3. Plaque: By Section 10 40 00.

C. Doorbell Disable Switch:

1. Single Pole Toggle Switch: Refer to Section 26 27 26.

2. Cover Plate: Refer to Section 26 27 26.

3. Plaque: By Section 10 40 00.

4. Location as shown on Drawings.

2.3 PHOTOELECTRIC RELAYS

A. Approved Manufacturers:

1. Allen-Bradley/Rockwell Automation (414-382-2000)

2. Intermatic, Inc. (815-675-7000)

3. Rhodes: M H Rhodes, Inc. (800-548-3647)

4. Tork, Inc. (914-664-3542)

B. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A.

C. Light-Level Monitoring Range: 0 to 3500 fc with an adjustment for turn-on/turn-off levels.

D. Time Delay: Prevents false operation.

E. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

2.4 MULTIPOLE CONTACTORS AND RELAYS

A. Approved Manufacturers:

1. Challenger Electrical Equipment Corp. (412-920-2400)

2. Cutler-Hammer Products; Eaton Corporation (800-498-2678)

3. GE Lighting Controls (888-437-3765)

4. Hubbell Lighting, Inc. (864-599-6000)

5. Siemens Energy and Automation, Inc. (800-964-4114)

6. Square D Co.; a Division of Groupe Schneider, Power Management Organization (888-778-2733)

B. Description: Electrically operated and mechanically held, and complying with UL 508 and NEMA ICS 2.

1. Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).

2. Control Coil Voltage: Match control power source.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install equipment level and plumb and according to manufacturer's written instructions.

B. Mount lighting control devices according to manufacturer's written instructions and requirements in Section 26 05 00 - "Common Work Results for Electrical".

C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

A. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Section 26 05 19 - "Low-Voltage Electrical Power Conductors and Cables" for low-voltage connections.

B. Wiring Method: Install all wiring in raceway as specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

C. Bundle, train, and support wiring in enclosures.

D. Ground equipment.

E. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 - "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

B. Check tightness of electrical connections with torque wrench.

C. Verify settings of photoelectric devices with photometer.

D. Perform the following according to manufacturer's written instructions:

1. Continuity tests of circuits.

2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.

a. Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

E. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

F. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

G. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.5 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

3.6 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 26 60 00

SECTION 28 31 00 - FIRE ALARM AND DETECTION SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Automatic and Manual Fire Alarm System, complete per NFPA 70, 72, and 101 and applicable local, state and national codes

2. The Contract Documents are to relay minimum design intent. It is the Contractor's responsibility to provide a complete approved and operable system.

3. The Contractor shall supply an addressable system to comply with this specification.

B. Related Documents:

1. Marriott's Fire Protection and Life Safety Design Standards (Module 14):

a. Marriott's Fire Protection and Life Safety Design Standards apply to all Marriott International Brands and owned, managed and franchised properties.

b. Marriott's Fire Protection and Life Safety Design Standards include Design Standards, performance criteria, reference standards and life safety process verification that define a comprehensive fire protection program.

C. Related Sections:

1. Section (14 24 23) – Elevators.

2. Section (21 10 00) - Fire Protection.

3. Section (26/27 05 00) - Basic Electrical Materials and Methods

1.02 SYSTEM DESCRIPTION

A. General: Non-coded point addressable-analog system with manual and automatic alarm initiation; automatic sensitivity control and monitoring of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service only.

B. Automatic and selective fire alarm notification using vibrating electric horn (with strobe where required) to all occupiable spaces including each guestroom. Horns shall sound at temporal march-time.

C. Activation of any standpipe or sprinkler tamper switch shall activate a distinctive system audible supervisory signal and illuminate a valve tamper LED at the system controls (so that there shall be no confusion between valve tamper activation and opens and/or ground on fire alarm initiation wiring) and visually indicate the type of device at the graphic annunciator on an addressable system.

D. All manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system supervisory signal.

E. Each independently supervised circuit shall include a discrete amber "Trouble" LED to indicate disarrangement conditions per circuit.

F. Supervise the incoming power to the system so that any power failure shall be audibly and visually indicated at both the control panel and the graphic annunciator.

G. Provide low/high air supervisory signal for dry automatic sprinkler system.

H. Provide running, power fault, and phase reversal trouble signals for fire pump.

I. Provide running and power fault trouble signals for the generator.

J. Provide signal circuit and auxiliary function disconnect capability by disconnect switch or keypad to facilitate testing without disruption.

1. Provide the following at the FACP:

a. Disconnect switches to disable notification, audible appliances, visual strobes, and auxiliary function points for testing purposes.

b. Alarm sensitivity testing at the FACP.

K. Provide all zones or alphanumeric point of address designations in property operation's terminology.

1.03 SUBMITTALS

A. Refer to Section 01330 - Submittals: Procedures for submittals

1. Product Data:

a. Provide submittals in accordance with the requirements of Section 01330.

B. Provide Marriott's Fire Protection Department with 2 sets of system plans and equipment data sheets for review and approval prior to installation.

C. Forward subsequent changes to Marriott Fire Protection for final approval.

D. Record Documents:

1. Refer to Section 01785 - Project Record Documents and Section 01830 - Operating and Maintenance Data for required closeout documents to be provided at completion of Project. In addition to the documents listed in these Sections, the following documents shall be included:

a. Provide NFPA 72 test certification.

b. Record Documents shall include System Drawings, Equipment Data and Operation Instructions, and Maintenance Instruction Manuals.

1.04 QUALITY ASSURANCE

A. Equipment shall be manufactured by a firm who has been actively manufacturing fire alarm systems of the type required and shall have supplied similar equipment to comparable installations and rendered satisfactory service for a minimum of 10 years. All components of the fire alarm system shall be manufactured by the vendor supplying the equipment, and standard products of a single manufacturer.

B. Equipment manufacturer shall maintain factory trained personnel within 50 miles of the project site and shall be available 24 hours per day.

C. Material and equipment shall be new and UL listed.

1.05 EXTRA MATERIALS

A. Furnish extra materials described in Section 01790 (01 78 43) - "Spare Parts and Materials" that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Avendra, LLC Preferred Manufacturers:

1. None.

B. Approved Manufacturers:

1. ADT Security Services, Inc. (888-238-8988)
2. Edwards System Technology (919-662-4227)
3. Fire Control Instruments - FCI (781-370-0088)
4. Gamewell (888-347-3269)
5. Notifier (203-484-7125 x 5740)
6. Siemens Cerberus Division (816-373-3935)
7. SimplexGrinnell (800-746-7539)

2.02 MATERIALS

A. Fire Alarm Control Panel

1. Control Panel: Modular, solid state addressable.

2. Locate fire alarm control panel or annunciator in a location attended continuously by property associates.

3. The control panel shall contain modules which have the capability to perform the following functions.

a. Mount batteries in the control panel. Battery capacity shall be sufficient to provide for the entire system upon loss of normal 120 volt power for a period of twenty-four (24) hours with ten (10) minutes of alarm indication at the end of this period.

b. Control panel to include contacts for alarm and trouble connections to an approved Central Station. If required by Local Code, a municipal tie module shall be provided in lieu of the contacts for central station connection. Module shall be selected to be compatible with local city system.

c. Basic Fire Alarm Panel and Cabinet to house and power the listed modules and components.

B. Smoke Sensors (Detectors):

1. Guestrooms, Suite Rooms and other Sleeping Units

a. Provide smoke sensors with sounder bases to meet the following:

1) Photoelectric type sensor.

2) Sounder Base: Provide minimum audible alarm of 85 dBA at 10 feet; minimum of 75 dBA “at the pillow”.

3) Activation of room smoke sensor to immediately and automatically sound an alarm within the room of incident.

4) System smoke sensor normal and emergency power is provided by the FACP.

5) In Suites or other mixed Sleeping / Living Units, provide smoke sensors in each separate sleeping / living rooms (or in areas providing access to the corridor doorway). Multiple sensor sounder bases located within the same suite or unit shall sound at the same time.

2. Guestroom Smoke Alarms (Handicap Accessible and Hearing Impaired): Same as above with the following additions.

a. Visible Alarm Device: Xenon Strobe. Activation of detector to cause both alarm horn and visible alarm device (xenon strobe) to flash.

3. Smoke Detectors / Sensors are to be located per NFPA 72 so that the function is not to be compromised by air flow to or from grilles or ceiling fans.

4. Guestroom Smoke Sensors or Smoke Alarms are to be audibly and visually annunciated at the FACP and annunciators as Supervisory Signals.

5. Provide carbon monoxide detectors where shown on the drawings and as required by local ordinance.

C. Smoke Detectors - All Other Areas:

1. System Smoke Detectors: Photoelectric or ionization type for corridors and other areas, incorporating ability to be remotely tested by addressable system.

a. Finish: Manufacturer's standard beige/off-white.

2. Provide carbon monoxide detectors where shown on the drawings and as required by local ordinance.

D. Alarm Initiating Devices:

1. All initiating devices to be “point” addressable.

2. Manual Pull Stations: High impact Lexan, which will latch upon operation and remain latched until reset with a key. Locate at front desk only, unless required in other locations by applicable codes.

   a. Color: Red

3. Duct Smoke Sensors: Complete with a keyed ceiling mounted remote test switch with alarm lamp, wall mounted not higher than 80 inches above finished floor.

   a. Point addressable duct smoke sensors are to be installed at locations in supply and/or return air ducts of all air handling systems 2000 CFM or greater, or as required by local codes.

4. Heat Detectors: Rate-of-rise and automatically restorable.

5. Carbon Monoxide Detectors: Provide carbon monoxide detectors in mechanical rooms containing gas fired water heaters and in guestrooms, public spaces, and any location with gas fired fireplaces or other gas appliances. Connect so that detectors provide Supervisory alarm at Fire Alarm Control Panel (FACP).

6. Sprinkler water flow alarm/dry system pressure switch.

7. Low/High air alarm for dry system.

E. Alarm Notification Appliances

1. Mini Horns/Sounder Bases:

   a. Guestrooms: Install in all guestrooms, and in bedrooms of all suites, beige in color.

   b. Smoke Sensors with sounder bases may be installed in lieu of guestroom mini horns provided the sounder base meets the following requirements:

      1) Approval from the local authority having jurisdiction.

      2) Low-Rise Building

      3) Sensor bases must be capable of sounding both the local in-room alarm upon activation of the in-room / suite smoke sensor(s) and upon activation of the building fire alarm notification system.

2. Horns and Strobes:

   a. Public areas: Use horns with strobes, beige in color.

   b. Back of House: Use horns with strobes, beige in color.

   c. Accessible and Hearing-Impaired Guestrooms: Flashing lights for the hearing impaired shall be semi-recessed, with side-viewing tamper-proof lens. White lens with the word "Fire" in raised red letters. Flashing lights may be an integral part of the accessible guestroom detector and/or mini horn or may be a separate flashing device. Flashing lights shall be located in all sleeping areas, living areas and bathrooms.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install system in accordance with all national, state and local codes, UL standards, and the manufacturer's published instructions.

B. Provide necessary materials and appurtenances, including coordination with the Owner concerning a complete and timely central system tie-in between the fire alarm system and the local fire department or jurisdictional authority when required by Public Authorities. A functional test of the tie-in shall be demonstrated during the final fire alarm system testing.

C. Be responsible for designing and installing as complete fire alarm system that meets all codes.

D. Coordinate devices that pertain to other work in the contract with the appropriate trades.

E. Sprinkler flow and tamper switches will be furnished and installed under Section 13900 (21 10 00). The Electrical subcontractor shall be responsible for wiring and connection to sprinkler switches.

F. Cover smoke and carbon monoxide detectors to prevent contamination by dust and keep covered until Substantial Completion.

G. Provide duct detectors under the fire alarm system as required by code. Provide ceiling mounted remote test switch with indicator light for each duct detector.

H. Provide connectors and signals from devices in the elevator shaft, machine room, and landings to the elevator controller to complete activation and shutdown events required per ASME/ANSI A17.1, Standard Safety Code for Elevators and Escalators.

3.02 TESTING

A. The fire alarm system shall be pre-tested and certified by the fire alarm vendor per NFPA 72 (National Fire Alarm Code) prior to acceptance testing. A copy of the manufacturer representative's certification report shall be made available to the Marriott Representative and code official prior to the acceptance test by Marriott Corporate Fire Protection of the Code Official.

B. Test completed system in the presence of the Public Authority and Marriott's Fire Protection Department.

C. Provide equipment necessary to perform testing.

D. Refer to Submittals Paragraph for required certifications and documents to be provided with closeout documents.

3.03 TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

1. Conduct training as specified in Section 01820 (01 79 00) - "Training".

2. Train Owner's maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining system.

END OF SECTION

SECTION 312000
EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
2. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

J. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Warning tapes.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

1.5 QUALITY ASSURANCE

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 015000 "Temporary Facilities and Controls" and Section 311000 "Site Clearing" are in place.

E. Do not direct vehicle or equipment exhaust towards protection zones.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

G. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

H. Sand: ASTM C 33/C 33M; fine aggregate.

I. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.

2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.

2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.

3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
4. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches outside of concrete forms other than at footings.
    b. 12 inches outside of concrete forms at footings.
    c. 6 inches outside of minimum required dimensions of concrete cast against grade.
    d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
    e. 6 inches beneath bottom of concrete slabs-on-grade.
    f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.6 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Trenches under footing are not allowed. Step footing below utility.

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.14 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

PROJECT MANUAL

A NEW 106 ROOM MARRIOTT COURTYARD

Woodbury, New York

for

Rainbow Hospitality

a+e architects, p.c.
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