FLETCHERTHOMPSON
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# PROJECT MANUAL

PROJECT NO. NY12995.06

# NuHealth Executive Office Relocation
# NASSAU UNIVERSITY MEDICAL CENTER
# 19th FLOOR

2201 Hempstead Turnpike
East Meadow, New York

ADDENDUM #1
JANUARY 29, 2013

VOLUME 1 of 1

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PROJECT MANUAL

Project No. NY12995.06

Date: January 29, 2013

# NuHealth Executive Office Relocation

## NASSAU UNIVERSITY MEDICAL CENTER
## 19th FLOOR

2201 HEMPSTEAD TURNPIKE
EAST MEADOW, NEW YORK

FLETCHER THOMPSON ARCHITECTURE ENGINEERING, LLC

345 Seventh Avenue – Suite 15N
New York, NY 10001
Telephone: (212) 695-4767
Fax: (212) 695-4751

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| | |
|---|---|
| **Client:** | **Nassau University Medical Center**<br>2201 Hempstead Turnpike<br>East Meadow, New York |
| **Architect:** | **Fletcher Thompson**<br>345 Seventh Avenue, Suite 15N<br>New York, NY 10001 |
| **MEP:** | **Cosentini Associates**<br>Two Pennsylvania Plaza, Third Floor<br>New York, NY 10121 |

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## INTRODUCTORY INFORMATION



## DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS



## DIVISION 01 - GENERAL REQUIREMENTS



## DIVISION 02 - EXISTING CONDITIONS

Not Used

## DIVISION 03 - CONCRETE



## DIVISION 04 - MASONRY

Not Used

## DIVISION 05 - METALS



## DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

Not used

**DIVISION 14 - CONVEYING EQUIPMENT**

Not used

**DIVISION 21 - FIRE SUPPRESSION**



**DIVISION 22 - PLUMBING**



**DIVISION 23 – HVAC**

**DIVISION 26 - ELECTRICAL**



**DIVISION 27 - COMMUNICATIONS**

Not Used

**DIVISION 28 - ELECTRONIC SAFETY AND SECURITY**

Not Used

**DIVISION 31 - EARTHWORK**

Not Used

**DIVISION 32 - EXTERIOR IMPROVEMENTS**

Not Used

**DIVISION 33 - UTILITIES**

Not Used

END OF TABLE OF CONTENTS

**ELECTRONIC INFORMATION USAGE FORMS** **SECTION 00 85 13**

PART 1 – GENERAL

1.1 FOR ELECTRONIC FILES

A. The Contractor may request copies of the Architect's electronic files (drawings and specifications) for explicit use on this project. Subcontractors and suppliers may request files only through the Contractor.

B. The Architect will provide the requested copies of the Architect's electronic files under the following conditions:

1) The Contractor agrees to reimburse the Architect for the copies of the electronic files in an amount indicated on the attached "Request for Electronic Files" form.

2) The Contractor agrees to complete and submit the attached "Request" and "Agreement" forms to the Architect.

3) The completed forms will be accompanied by the Contractor's business check in payment for the copies of the electronic files.

C. Upon receipt of payment, the Architect will provide the requested electronic files to the Contractor within five (5) business days.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

END OF SECTION

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# REQUEST FOR ELECTRONIC FILES

The following information is in response to your request for copies of our electronic files regarding the project noted below (incomplete forms will delay the processing of the request; all requests are to be submitted to the FT Project manager.):

Date: _____
Requested by:
Company Name: _____
Requestor Name: _____

FT Project Manager: _____
FT Project Name: _____
FT Project No.: _____

List of Drawings Requested: _____
_____

File Format Requested: ☐ .DWG (AutoCAD 2006) ☐ .RVT ☐ .PDF ☐ .PLT

List of specification sections requested:
(All specifications shall be transmitted in .doc or.docx format)

Our service fee for the files listed above is:
Electronic Drawing formats (As above) $100.00/drawing

Total number of drawings requested:
Total cost of drawing request:

Specifications $20.00/section

Total number of sections requested:
Total cost of specifications request:

Receive file by: CD Picked up ☐ Email ☐ _____
Mailed CD ☐ _____
FTP ☐ _____

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Our receipt of the attached Agreement with your original signature, enclosed business check for the amount noted above, made payable to "Fletcher Thompson", FT shall acknowledge your acceptance of our Terms and Conditions. Based on such acceptance, we will provide the requested electronic files to you within five business days.

Contractor signature

# Agreement for Electronic File Transfer to Contractor

**Terms and Conditions**

It is understood and agreed that the drawings and specifications prepared for this project, whether in hard copy or electronic format, are instruments of professional service intended for one-time use in the construction of this project. Since the data provided is and shall remain the property of Fletcher-Thompson, Inc. or Fletcher Thompson Architecture Engineering, LLC. (Hereinafter referred to as "FT"), FT reserves any and all rights over the supplied data under copyright law.

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by us and the electronic files, the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, certify field conditions and coordinate your work with that of other contractors for the project.

Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display. While our systems are constantly examined, the supplied media has not been scanned for viruses and the end user is advised to take any appropriate actions deemed necessary prior to installation and use of electronic data supplied by FT.

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by us, and we make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In acknowledgment of the above, the undersigned agrees to assume all risks associated therewith and, to the fullest extent permitted by law, to hold harmless and indemnify FT. and any of its employees from and against all claims, liabilities, losses, damages, including without limitation damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss and costs, including but not limited to attorney's fees, arising out of or in any way connected with the use or inability to use the provided data or the modification or reuse by others of the electronic data provided by FT under this Agreement.

ACCEPTED

Name of Company/Organization

Name of Person

Title

Date

PART 1 - GENERAL

1.1 DEFINITIONS

A. Addenda:
1. An addendum is a document that is added to the original Contract Documents before the signing of the Owner/Contractor agreement to clarify, revise, add to, or delete from the Contract Documents or previous addenda.
2. The primary purpose of an addendum is to clarify the Drawings and Project Manual and respond to questions raised by the Contractor, or issue new requirements, including decisions to decrease or increase the scope of certain work.

B. Construction Change Directives:
1. A Construction Change Directive is a document that is added to the Contract Documents and issued after the signing of the Owner/Contractor agreement to clarify, revise, add to, or delete from the Contract Documents or previous changes.
2. The primary purpose of a Construction Change Directive is to clarify the Drawings and Project Manual and respond to questions raised by the Contractor, or issue new requirements, including decisions to decrease or increase the scope of certain work.
3. Construction Change Directives altering the amount of the Contract Price shall result in Change Orders issued by the Trade Contractor and must be reviewed by the Owner, Architect, prior to Contractor implementation.

C. Request for Information (RFI): A document submitted by a Contractor requesting information clarifying a portion of the Contract Documents, hereinafter referred to as an RFI, which is required to properly perform the Work and handled under provisions of Section 01 26 16.

1.2 FORMAT

A. Changes will follow a consistent format and will be filed after this page in the Project Manual. Replace revised pages and sections of the Project Manual as applicable and discard obsolete pages. Insert new sections in the proper order in the Project Manual.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. Project information.

B. Work covered by Contract Documents.

C. Access to site.

D. Coordination with occupants.

E. Work restrictions.

F. Specification and drawing conventions.

1.3 RELATED SECTIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Limitations and procedures governing temporary use of Owner's facilities.

1.4 PROJECT INFORMATION

A. Project Identification: NuHealth Executive Office Relocation – Floor.

1. Project Location: Nassau University Medical Center, 2201 Hempstead Turnpike, East Meadow, New York

B. Owner: Nassau University Medical Center.

1. Owner's Representative: _____.

C. Architect: Fletcher Thompson Architecture Engineering, LLC, 345 Seventh Avenue, Suite 15N, New York, New York 10001.

D. Contractor: _____ has been engaged as Contractor for this project.

## 1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the project is defined by the Contract Documents and consists of the following:

1. Interior demolition of existing partition walls, ligting, ceiling tiles and suspension grid prior to construction of new renovation. New work consists of light gage metal framing, and gypsum board partitions, new doors, interior finishes, millwork cabinetry. Additional work shall include mechanical HVAC, electrical and plumbing work.

B. Type of Contract

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

## 1.6 ACCESS TO SITE

A. General: Contractor shall have limited use of project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this section.

B. Use of Site: Limit use of project site to areas within the Contract limits indicated. Do not disturb portions of project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas shown on construction drawings.
2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

## 1.7 COORDINATION WITH OCCUPANTS

A. Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

## 1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 4 p.m., Monday through Friday, except as otherwise indicated.

1. Weekend Hours: To be determined by Owner.
2. Early Morning Hours: To be determined by Owner..

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two (2) days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

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

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

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

F. Controlled Substances: Use of tobacco products and other controlled substances within the existing building is not permitted.

G. Employee Identification: Owner will provide identification tags for Contractor personnel working on the project site. Require personnel to utilize identification tags at all times.

H. Employee Screening: Comply with Owner's requirements regarding drug, and background screening of Contractor personnel working on the project site.

1. Maintain list of approved screened personnel with Owner's Representative.

## 1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of sections in Division 01 apply to the Work of all sections in the specifications.

C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the specifications. One (1) or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual specifications sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing specification section numbers found in this Project Manual.

1.10 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

# SUBSTITUTION PROCEDURES SECTION 01 25 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for substitutions.

1.3 RELATED SECTIONS

A. Section 01 60 00 - Product Requirements: Requirements for submitting comparable product submittals for products by listed manufacturers.

B. Divisions 02 through 26 sections for specific requirements and limitations for substitutions.

1.4 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other project requirements but may offer advantage to Contractor or Owner.

1.5 SUBMITTALS

A. Substitution Requests: Submit three (3) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include specification section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use facsimile of form provided in the Project Manual.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.

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

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.6 QUALITY ASSURANCE

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

## 1.7 PROCEDURES

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

# PART 2 - PRODUCTS

## 2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION

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# SUBSTITUTION REQUEST FORM

This Substitution Request Form may be used for Bid Substitution Requests or Post-Bid Substitution Requests as specified in Section 01 25 00.

**TO:** _____

**PROJECT:** _____

**A/E PROJECT NO:** _____ **DATE:** _____

**SPECIFICATION ITEM:**

Section | Page | Paragraph | Description

**DRAWING ITEM:**

Drawing No. | Detail No. | Description

Substitution approval is an acceptance of only the manufacturer and product for general conformance with the design concept reflected in the Contract Documents. The A/E has made no attempt to verify specific performance data, or to check the details of the proposed substitution as to special features, capacities, physical dimensions or code and/or regulatory compliance, all of which remain the responsibility of the person/entity submitting the proposed substitution.

**The undersigned requests consideration of the following:**

**PROPOSED SUBSTITUTION:** _____

Attached data includes product description, specifications, drawings, photographs, performance and test data, environmental performance 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. The proposed substitution does not affect dimensions shown on the Drawings.
2. The undersigned will pay for changes to the building design, including design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution meets the requirements for recycled content, VOC content, etc. necessary to achieve LEED Certification (where applicable).
3. The proposed substitution will have no adverse affect on the work of other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be **locally** available for the proposed substitution.

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

**The undersigned agrees that, if this page is reproduced, the terms and conditions for substitutions found in the Bidding and Contract Documents apply to this request.**

**SUBMITTED BY:**

Name ( Printed )

Signature

Firm Name

Address

City, State, Zip

Date

Telephone Fax

Contractor ( if after award of Contract )

For use by the A/E

❒ Accepted ❒ Accepted as noted

❒ Not Accepted ❒ Received too late

❒ Incomplete Information

Reviewed By

Date

Remarks

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# CONTRACT MODIFICATION PROCEDURESSECTION 01 26 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

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

1.3 RELATED SECTIONS

A. Section 01 60 00 - Product Requirements: Administrative procedures for handling requests for substitutions made after Contract award.

1.4 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.5 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and specifications.
   1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 60 00 if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.6 ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 10 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 10 days after such authorization.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

1.7 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

B. For work performed by a Bid Package Subcontractor the cost to the owner may include a markup for Overhead and Profit not to exceed fifteen (15) percent on self performed labor, their own equipment and materials and five (5) percent markup on Sub Contractor work. Subcontractor markup for all tiers shall be no greater than five (5) percent. Markups may include; main office overhead, bond, project manager time, insurance, small tools

1.8 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. Administrative requirements for requests for information.

1.3 DEFINITIONS

A. Request For Information (RFI): A document submitted by Contractor requesting information clarifying a portion of the Contract Documents, hereinafter referred to as an RFI, which is required to properly perform the Work.

B. Improper RFI: An RFI that is not properly prepared or that requests information that, in the opinion of the Architect, is discernable from the Contract Documents, that has previously been addressed and documented in job meeting minutes or where time permits it to be addressed at a subsequent job meeting.
   1. Costs incurred by the Architect to process an Improper RFI will be backcharged to the Contractor in accordance with procedures set forth elsewhere in this Section.

1.4 CONTRACTOR'S REQUESTS FOR INFORMATION FORM

A. RFI's shall be submitted on a form prepared by the Contractor and approved by the Architect, which shall include the following items:

   1. Date of RFI
   2. RFI Number
   3. To (Including Name, Address, Phone and Fax Numbers of Recipient)
   4. From (Including Name, Address, Phone and Fax Numbers of Sender)
   5. Project Name
   6. Architect’s Project Number
   7. Latest date response is required by Sender
   8. Clearly stated description of information required.
   9. A space for the Recipient to indicate if a Potential Cost / Time Change is anticipated.
   10. Contractor's proposed solution or recommendation.
   11. A space for the Recipient to record the Response Date.
   12. A space for the Recipient to record the Respondent’s name.

13. A space for the Recipient to record the response.

## 1.5 SUBMITTAL OF RFI'S BY CONTRACTOR

A. A properly prepared request for information shall include a detailed written statement that indicates the specific Drawings or Specification in need of clarification and the nature of the clarification requested.

1. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after photocopying or transmission by facsimile (fax).

    a. Drawings shall be referenced by number and location on the drawing sheet.
    b. Specifications shall be referenced by Section number, page and paragraph.
2. RFI's shall be submitted in numerical order with no breaks in the consecutive numbering.
3. Each page of attachments to RFI's shall bear the RFI number in upper right hand corner and shall be consecutively numbered in chronological order.
4. RFI's may be submitted by E-Mail, facsimile or regular mail; E-mail addresses will be distributed at the Pre-Construction Conference. Contractor shall use only one (1) transmission method, e-mail, facsimile or regular mail for each RFI; follow-ups in another form shall not be sent.

B. When the Contractor is unable to determine from the Contract Documents, the material, process or system to be installed, the Architect shall be requested to make a clarification of the indeterminate item.

1. When possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Architect.

C. RFI's from subcontractors, vendors or material suppliers must be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Architect's designated representative.

D. Contractor shall carefully study the Contract Documents to assure that the RFI is not an "Improper RFI."

E. RFI's shall not be used for the following purposes:

1. To request approval of submittals.
2. To request approval of substitutions.
3. To request changes which are known to entail additional cost or credit. Use a Change Order Request form instead.
4. To request different methods of performing work other than those drawn and / or specified.

F. In the event the Contractor believes that a clarification by the Architect will result in additional cost or time, Contractor shall not proceed with the work indicated by the RFI until a Change Order (or Construction Change Directive, if applicable to project) is prepared and approved.

G. Contractor shall prepare and maintain a log of RFI's, and at any time requested by the Architect, Contractor shall furnish copies of the log showing outstanding RFI's. Contractor shall note unanswered RFI's in the log.

1.6 ARCHITECT'S PROCESSING OF RFI'S

A. The Architect will require a minimum of five (5) working days from Architect's receipt to respond to the RFI.

B. Answered RFI's shall not be construed as approval to perform extra work.

C. Architect will respond to RFI’s on one of the following forms:

1. Properly Prepared RFI's:

   a. Response directly upon Request for Information form or attached thereto.
2. Improper RFI's That Are Not Properly Prepared:

   a. Returned noted "IMPROPER - INCOMPLETE."
3. Improper RFI's That Have Been Previously Addressed or Addressed in Meeting Minutes:

   a. Returned noted "IMPROPER – PREVIOUSLY ADDRESSED."
4. Improper RFI's That Are Adequately Addressed on Contract Documents:

   a. Returned noted "IMPROPER – SEE CONTRACT DOCUMENTS."

1.7 PROCEDURES FOR ARCHITECT'S PROCESSING OF RFI’S

A. Process for Backcharging:

1. Improper RFI's will be processed by the Architect at the Architect's standard hourly billing rates.
2. Architect will charge the Owner and the Owner will deduct such costs from monies still due the Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

## 1.2 SECTION INCLUDES

A. Administrative provisions for coordinating construction operations on project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

## 1.3 RELATED SECTIONS

A. Section 01 73 00 - Execution: Procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

B. Section 01 77 00 - Closeout Procedures: Coordinating closeout of the Contract.

## 1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different sections of the specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different sections, that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with 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.

C. 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.

D. 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.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

## 1.5 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. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

b. Indicate required installation sequences.
c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit three (3) opaque copies of each submittal. Architect, through Construction Manager, will return two (2) copies.

a. Submit five (5) copies where Coordination Drawings are required for operation and maintenance manuals. Architect and Construction Manager will retain two (2) copies; remainder will be returned. Mark up and retain one (1) returned copy as a Project Record Drawing.

4. Refer to individual sections for Coordination Drawing requirements for Work in those sections.

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

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

## 1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

## 1.7 PROJECT MEETINGS

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

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five (5) days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, Construction Manager, and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Preparation of Record Documents.
    l. Use of the premises.
    m. Work restrictions.
    n. Owner's occupancy requirements.
    o. Responsibility for temporary facilities and controls.
    p. Construction waste management and recycling.
    q. Parking availability.
    r. Office, work, and storage areas.
    s. Equipment deliveries and priorities.
    t. First aid.
    u. Security.
    v. Progress cleaning.
    w. Working hours.

3. Minutes: Record and distribute meeting minutes.

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

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the

meeting. Advise Architect and Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. The Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility problems.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written recommendations.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at [**weekly**] [**biweekly**] [**monthly**] [**regular**] [**Insert appropriate interval**] intervals. Coordinate dates of meetings with preparation of payment requests.

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

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

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

        1) Review schedule for next period.

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

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Status of correction of deficient items.
        14) Field observations.
        15) RFIs.
        16) Status of proposal requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

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

E. Coordination Meetings: Conduct project coordination meetings at [**weekly**] [**biweekly**] [**monthly**] [**regular**] [**Insert appropriate interval**] intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of project.

    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Work hours.
        10) Hazards and risks.
        11) Progress cleaning.
        12) Quality and work standards.
        13) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

## 1.2 SECTION INCLUDES

A. Administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

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

## 1.3 RELATED SECTIONS

A. Section 01 31 00 - Project Management and Coordination: Submitting and distributing meeting and conference minutes.

B. Section 01 33 00 - Submittal Procedures: Submitting schedules and reports.

C. Section 01 40 00 - Quality Requirements: Submitting a schedule of tests and inspections.

## 1.4 DEFINITIONS

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

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

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

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

E. Event: The starting or ending point of an activity.

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

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For scheduling consultant.

C. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.

2. Specification section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

D. Preliminary Construction Schedule: Submit two (2) opaque copies.

1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

E. Preliminary Network Diagram: Submit two (2) opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

F. Contractor's Construction Schedule: Submit two (2) opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

G. CPM Reports: Concurrent with CPM schedule, submit three (3) copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

H. Daily Construction Reports: Submit two (2) copies at weekly intervals.

I. Material Location Reports: Submit two (2) copies at weekly intervals.

J. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.

K. Special Reports: Submit two (2) copies at time of unusual event.

## 1.6 QUALITY ASSURANCE

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

B. Prescheduling Conference: Conduct conference at project site to comply with requirements in Section 01 31 00. Review methods and procedures related to the

Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing and partial Owner occupancy.
4. Review time required for review of submittals and resubmittals.
5. Review requirements for tests and inspections by independent testing and inspecting agencies.
6. Review time required for completion and startup procedures.
7. Review and finalize list of construction activities to be included in schedule.
8. Review submittal requirements and procedures.
9. Review procedures for updating schedule.

## 1.7 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

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

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

# PART 2 - PRODUCTS

## 2.1 SUBMITTALS SCHEDULE

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

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

    a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

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

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

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

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include not less than 10 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

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

1. Phasing: Arrange list of activities on schedule by phase.
2. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use of premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.

e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Startup and placement into final use and operation.

4. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Permanent space enclosure.
c. Completion of mechanical installation.
d. Completion of electrical installation.
e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

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

1. Refer to Section 01 29 00 for cost reporting and payment procedures.
2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of five (5) percent of the Contract Sum.
3. Each activity cost shall reflect an accurate value subject to approval by Architect.
4. Total cost assigned to activities shall equal the total Contract Sum.

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

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

## 2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven (7) days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

## 2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one (1) workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

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

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.

i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

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

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

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

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two (2) cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
b. Submit value summary printouts one (1) week before each regularly scheduled progress meeting.

## 2.5 REPORTS

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

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

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

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

## 2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one (1) day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel,

evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Actual Completion percentage for each activity.

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

1. Post copies in project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

**SUBMITTAL PROCEDURES** **SECTION 01 33 00**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. Requirements for the submittal schedule and administrative and procedural requirements for submitting shop drawings, product data, samples, and other submittals.

1.3 RELATED SECTIONS

A. Section 01 32 00 - Construction Progress Documentation: Submitting schedules and reports, including Contractor's construction schedule.

B. Section 01 78 23 - Operation and Maintenance Data: Submitting operation and maintenance manuals.

C. Section 01 78 39 - Project Record Documents: Submitting record Drawings, record specifications, and record product data.

1.4 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual specification sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual specification sections as informational submittals.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

## 1.5 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   3. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification section number and title.
      c. Submittal category: Action, informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled dates for purchasing.
      h. Scheduled dates for installation.
      i. Activity or event number.

## 1.6 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same specification section as separate packages under separate transmittals.
   4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: All submittals will be reviewed in a timely manner. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: If necessary, process it in same manner as initial submittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use specification section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    j. Number and title of appropriate specification section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

E. Options: Identify options requiring selection by the Architect.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one (1) copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
    a. Project name.

b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification section number and title.
i. Indication of full or partial submittal.
j. Drawing number and detail references, as appropriate.
k. Transmittal number, numbered consecutively.
l. Submittal and transmittal distribution record.
m. Remarks.
n. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual specification sections. Types of submittals are indicated in individual specification sections.
1. Action Submittals: Submit three (3) paper copies of each submittal, unless otherwise indicated. Architect will return two (2) copies.
2. Informational Submittals: Submit two (2) paper copies of each submittal, unless otherwise indicated. Architect will not return copies.
3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and

certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a notarized statement on original paper copy certificates and certifications where indicated.
5. Test and Inspection Reports Submittals: Comply with requirements specified in Section 01 40 00.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as shop drawings, not as product data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying shop drawings.
5. Submit product data before or concurrent with samples.
6. Submit product data in the following format:
    a. Three (3) paper copies of product data, unless otherwise indicated. Architect will return two (2) copies.

C. Shop Drawings: Prepare project-specific information, drawn accurately to scale. Do not base shop drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit shop drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
3. Submit shop drawings in the following format:

a. Three (3) opaque copies of each submittal. Architect will retain two (2) copies; remainder will be returned.

D. Samples: Submit samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit samples that contain multiple, related components such as accessories together in one (1) submittal package.
   2. Identification: Attach label on unexposed side of samples that includes the following:
      a. Generic description of sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable specification section.
   3. Disposition: Maintain sets of approved samples at project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual specification sections. Such samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit one (1) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   5. Samples for Verification: Submit full-size units or samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
      a. Number of Samples: Submit three (3) sets of samples. Architect will retain two (2) sample sets; remainder will be returned.
         1) Submit a single sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
         2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a sample, submit at least three (3) sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual specification sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:
    a. PDF electronic file.
    b. Three (3)] [Insert number paper copies of product schedule or list, unless otherwise indicated. Architect will return two (2) copies.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00.

G. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related specification section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontract list in the following format:
    a. Number of Copies: Three (3) paper copies of subcontractor list, unless otherwise indicated. Architect will return two (2) copies.

H. Coordination Drawings: Comply with requirements specified in Section 01 31 00.

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

R. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Maintenance Data: Comply with requirements specified in Section 01 78 23.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

## 2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract

Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to shop drawings, product data, and other required submittals, submit three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include project name and location, submittal number, specification section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Re-Submittals will be considered nonresponsive, and will be returned without review if reviewers' comments from previous submission have not been addressed.

G. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

**CONTRACTOR / SUBCONTRACTOR'S LETTERHEAD**

To: Fletcher Thompson Architecture Engineering, LLC
345 Seventh Avenue – Suite 15N
New York, NY 10001

Project: NuHealth Executive Office Relocation
Nassau University Medical Center – 19th Floor
East Meadow, NY 11554
Architect's Project Number NY12995

I (we) certify that the indicated product below is exactly as specified. This product is contained in Section _____of the Specifications prepared by Fletcher Thompson Architecture Engineer, LLC dated _____, 2013. The Manufacturer of this product is _____ and the brand or model is _____. I (we) also agree that the above stated product has no complex relationship with other products nor requires selection of colors of textures.

(Insert any special provisions required).

_____
Signed: General Contractor

_____
Signed: Subcontractor

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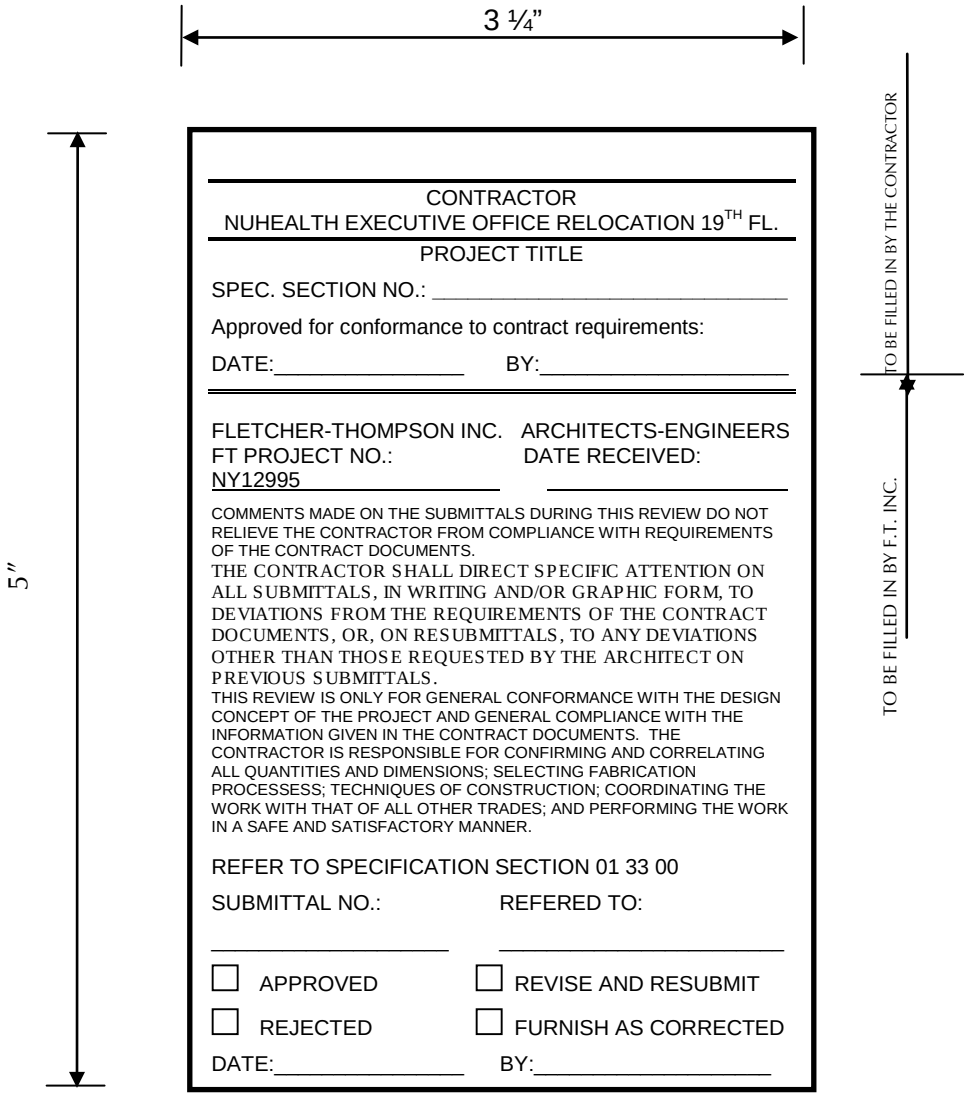


END OF SECTION

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# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

## 1.2 SECTION INCLUDES

A. Administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the sections that specify those activities. Requirements in those sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this section.

## 1.3 RELATED SECTIONS

A. Section 01 73 29 - Cutting and Patching: Repair and restoration of construction disturbed by testing and inspecting activities.

B. Divisions 02 through 26 sections for specific test and inspection requirements.

## 1.4 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Owner.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

   1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

## 1.5 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

## 1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For testing agencies specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and specification section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar

documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual specification sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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

F. Specialists: Certain sections of the specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E548; and with additional qualifications specified in individual sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for project.
    e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

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

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Owner.
2. Notify Architect and Owner seven (7) days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's and Construction Owner's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven (7) days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual sections in Divisions 02 through 26.

## 1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00.

C. 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.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

## 1.9 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. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. 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. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's and Owner's reference during normal working hours.

3.2 REPAIR AND PROTECTION

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

1. Comply with the Contract Document requirements for Section 01 73 29.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

## 1.2 SECTION INCLUDES

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

## 1.3 RELATED SECTIONS

A. Section 01 10 00 - Summary: Work restrictions and limitations on utility interruptions.

## 1.4 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's maintenance forces, Architect, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

## 1.5 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage, including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

C. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air filtration system discharge.
4. Other dust-control measures.
5. Waste management plan.

## 1.6 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.

C. Accessible Temporary Egress: Comply with applicable provisions in ICC/ANSI A117.1.

## 1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to 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 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E84.

B. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

## 2.2 TEMPORARY FACILITIES

A. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect,, and construction personnel office activities and to accommodate project

meetings specified in other Division 01 sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for project-site documents including file cabinets, plan tables, plan racks.
2. Room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than one (1) receptacle on each wall. Furnish room with conference table, chairs, and 4-foot square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 degrees F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

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

1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Air Filtration Units: HEPA primary and secondary filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

# 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. General: Install temporary service or connect to existing service.

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

B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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

D. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

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

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

F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

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

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

## 3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

C. 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 Section 01 73 00 for progress cleaning requirements.

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

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

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

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

## 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, pollution or other undesirable effects.

   1. Comply with work restrictions specified in Section 01 10 00.

B. 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.
   1. Construct dustproof partitions with two (2) layers of 6-mil polyethylene sheet on each side. Cover floor with two (2) layers of 6-mil polyethylene sheet, extending

sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant treated plywood.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Insulate partitions to control noise transmission to occupied areas.
4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
5. Provide walk-off mats at each entrance through temporary partition.

## 3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

END OF SECTION

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

## 1.2 SECTION INCLUDES

A. Administrative and procedural requirements for selection of products for use in project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

## 1.3 RELATED SECTIONS

A. Section 01 25 00 - Substitution Procedures: Requests for substitutions.

## 1.4 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, which is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

## 1.5 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include specification section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one (1) week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 01 33 00.
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00. Show compliance with requirements.

## 1.6 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two (2) or more products for use on project, select product compatible with products previously selected, even if previously selected products were also options.

## 1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

## 1.8 PRODUCT WARRANTIES

A. Warranties specified in other sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include project-specific information and properly executed.
2. Specified Form: When specified forms are included with the specifications, prepare a written document using indicated form properly executed.
3. Refer to Divisions 02 through 49 sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00.

# PART 2 - PRODUCTS

## 2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where specifications include a list of names of both manufacturers and products, provide one (1) of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    b. Non-restricted List: Where specifications include a list of names of both available manufacturers and products, provide one (1) of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" article for consideration of an unnamed product.

4. Manufacturers:

    a. Restricted List: Where specifications include a list of manufacturers' names, provide a product by one (1) of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

5. Basis-of-Design Product: Where specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one (1) of the other named manufacturers. Drawings and specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" article for consideration of an unnamed product by one (1) of the other named manufacturers.

C. Visual Matching Specification: Where specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 for proposal of product.

D. Visual Selection Specification: Where specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

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

1. Evidence that the proposed product does not require revisions to the Contract Documents, which it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

## PART 3 - EXECUTION (Not Used)

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. General procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

1.3 RELATED SECTIONS

A. Section 01 31 00 - Project Management and Coordination: Procedures for coordinating field engineering with other construction activities.

B. Section 01 33 00 - Submittal Procedures: Submitting surveys.

C. Section 01 73 29 - Cutting and Patching: Procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

D. Section 01 77 00 - Closeout Procedures: Submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For professional engineer.

C. Certificates: Submit certificate signed by professional engineer certifying that location and elevation of improvements comply with requirements.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Certified Surveys: Submit three (3) copies signed by professional engineer.

F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to project that must be performed by public utilities serving project site.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests in accordance with Section 01 26 16.

## 3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

## 3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

## 3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of eight (8) feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. 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.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

## 3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

## 3.7 PROGRESS CLEANING

A. General: Clean project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one (1) installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than seven (7) days during normal weather or three (3) days if the temperature is expected to rise above 80 degrees F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## 3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Section 01 40 00.

## 3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

## 3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 01 73 29.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. Procedural requirements for cutting and patching.

1.3 RELATED SECTIONS

A. Section 02 41 19 - Selective Structure Demolition: Demolition of selected portions of the building.

B. Divisions 02 through 49 sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

C. Section 07 84 13 - Penetration Firestopping: Patching fire-rated construction.

1.4 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

## 1.6 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Fire-suppression systems.
3. Mechanical systems piping and ducts.
4. Control systems.
5. Communication systems.
6. Electrical wiring systems.
7. Operating systems of special construction in Division 13 sections.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, and equipment.
5. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. General: Comply with requirements specified in other sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

## 3.3 PERFORMANCE

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

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

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

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

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

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

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

b. Restore damaged pipe covering to its original condition.

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

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

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

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**CLOSEOUT PROCEDURES** **SECTION 01 77 00**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

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

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

1.3 RELATED SECTIONS

A. Section 01 73 00 - Execution: Progress cleaning of project site.

B. Section 01 78 23 - Operation and Maintenance Data: Operation and maintenance manual requirements.

C. Section 01 78 39 - Project Record Documents: Submitting Record Drawings, Record specifications, and Record Product Data.

D. Divisions 02 through 49 sections for specific closeout and special cleaning requirements for the Work in those sections.

1.4 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. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. 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. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

## 1.5 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.
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.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

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

## 1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three (3) copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

## 1.7 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

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

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," project name, and name of Contractor.

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

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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

## 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 ducts, blowers, and coils if units were operated without filters during construction.
r. 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.
s. Leave project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid project of rodents, insects, and other pests. Prepare a report.

D. 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

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 specification sections, apply to this section.

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems, and equipment.

1.3 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures: Submitting copies of submittals for operation and maintenance manuals.

B. Section 01 77 00 - Closeout Procedures: Submitting operation and maintenance manuals.

C. Section 01 78 39 - Project Record Documents: Preparing Record Drawings for operation and maintenance manuals.

D. Divisions 02 through 26 sections for specific operation and maintenance manual requirements for the Work in those sections.

1.4 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Initial Submittal: Submit three (3) draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return two (2) copies of draft and mark whether general scope and content of manual are acceptable.

C. Final Submittal: Submit one (1) copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit three (3) copies of each corrected manual within 15 days of receipt of Architect's comments.

## 1.6 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one (1) factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

# PART 2 - PRODUCTS

## 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to specification section number in Project Manual.

1. If operation or maintenance documentation requires more than one (1) volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one (1) system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two (2) or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major

components of equipment included in the section on each divider, cross-referenced to specification section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this section, include operation data required in individual specification sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference specification section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference specification section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one (1) item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Section 01 78 39.

G. Comply with Section 01 77 00 for schedule for submitting operation and maintenance documentation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

1.3 RELATED SECTIONS

A. Section 01 77 00 - Closeout Procedures: General closeout procedures.

B. Section 01 78 23 - Operation and Maintenance Data: Operation and maintenance manual requirements.

C. Divisions 02 through 49 sections for specific requirements for Project Record Documents of the Work in those sections.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Record Drawings: Comply with the following:

1. Number of Copies: Submit one (1) set of marked-up Record Prints.

C. Record Specifications: Submit one (1) copy of project's Specifications, including addenda and contract modifications.

D. Record Product Data: Submit one (1) copy of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or shop drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If shop drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and shop drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.
3. Print the Contract Drawings and shop drawings for use as Record Transparencies. Architect will make the Contract Drawings available to Contractor's print shop.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor shop drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

A. Preparation: Mark specifications to indicate the actual product installation where installation varies from that indicated in specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

## 2.3 RECORD PRODUCT DATA

A. Preparation: Mark product data to indicate the actual product installation where installation varies substantially from that indicated in product data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

## 2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other specification sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

# PART 3 - EXECUTION

## 3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one (1) copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of project.

B. Maintenance of Record Documents and Samples: Store Record Documents and samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION

# 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 SECTION INCLUDES

A. Cast-in-place lightweight concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

## 1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Action Submittal:
   1. Design Mixtures: For each concrete mixture.

## 1.4 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

B. Comply with the following sections of ACI 301, unless modified by requirements in the Contract Documents:
   1. "General Requirements."
   2. "Reinforcement and Reinforcement Supports."
   3. "Concrete Mixtures."
   4. "Handling, Placing, and Constructing."

C. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

# PART 2 - PRODUCTS

## 2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A82, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A185, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A497, flat sheet.

## 2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout project:
   1. Portland Cement: ASTM C150, Type I.

B. Normal-Weight Aggregate: ASTM C33, graded, 1-1/2-inch nominal maximum aggregate size.

C. Water: ASTM C94.

## 2.3 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will 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 C494, Type A.
   2. Retarding Admixture: ASTM C494, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C494, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

## 2.4 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber, or ASTM D1752, cork or self-expanding cork.

## 2.5 CURING MATERIALS

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

B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

## 2.6 CONCRETE MIXTURES

A. Comply with ACI 301 requirements for concrete mixtures.

B. Light-Weight Concrete: Prepare design mixes, proportioned according to ACI 301, as follows:
   1. Minimum Compressive Strength: As indicated on Drawings at 28 days.
   2. Maximum Water-Cementitious Materials Ratio: 0.45.
   3. Slump Limit: Four (4) inches for concrete with verified slump of two (2) to four (4) inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus one (1) inch.
   4. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed three (3) percent.

## 2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94, and furnish batch ticket information.
   1. When air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

# PART 3 - EXECUTION

## 3.1 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

## 3.2 STEEL REINFORCEMENT

A. 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.

## 3.3 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Locate and install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

## 3.4 CONCRETE PLACEMENT

A. Comply with ACI 301 for placing concrete.

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

C. Consolidate concrete with mechanical vibrating equipment.

## 3.5 FINISHING UNFORMED SURFACES

A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.
   1. Do not further disturb surfaces before starting finishing operations.

C. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

## 3.6 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 with ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to 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. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure formed and unformed concrete for at least seven (7) days by one (1) 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.
   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.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

## 3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests: Perform according to ACI 301.
   1. Testing Frequency: One (1) composite sample shall be obtained for each 100 cu yd or fraction thereof of each concrete mix placed each day.

## 3.8 REPAIRS

A. Remove and replace concrete that does not comply with requirements in this section.

END OF SECTION

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# 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 SECTION INCLUDES

A. Steel framing and supports for applications where framing and supports are not specified in other sections.

B. Steel framing and supports for mechanical and electrical equipment.

C. Loose bearing and leveling plates for applications where they are not specified in other sections.

D. Steel weld plates and angles.

E. Products furnished, but not installed, under this section:
   1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other sections.

## 1.3 RELATED SECTIONS

A. Section 03 30 53 – Miscellaneous Cast-in-Place Concrete: Installing anchor bolts, weld, plates, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

B. Division 09 91 00 – Paints and Coatings. Comply with section for priming and finish paint.

## 1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

## 1.5 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For the following:
   1. Paint products.
   2. Grout.

C. Shop Drawings: Show fabrication and installation details for metal fabrications.

   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

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.

## 1.6 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For qualified professional engineer.

C. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.

D. Welding certificates.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

## 1.7 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

   1. AWS D1.1, "Structural Welding Code - Steel."
   2. AWS D1.2, "Structural Welding Code - Aluminum."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

## 1.8 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 (1) another.

B. Coordinate installation of anchorages for casting into concrete. 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

## 2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

## 2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A36.

B. Steel Tubing: ASTM A500, cold-formed steel tubing.

C. Steel Pipe: ASTM A53, standard weight (Schedule 40) unless otherwise indicated.

D. Stainless Steel Sheet, Strip, and Plate: ASTM A240 or ASTM A666, Type 304.

## 2.3 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

C. Aluminum Castings: ASTM B26, Alloy 443.0-F.

## 2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless steel fasteners for fastening aluminum.

2. Provide stainless steel fasteners for fastening stainless steel.
3. Provide stainless steel fasteners for fastening nickel silver.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A325, Type 3; with hex nuts, ASTM A563, Grade C3; and, where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy Group 1.

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A489.

G. Machine Screws: ASME B18.6.3.

H. Lag Screws: ASME B18.2.1.

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1.

K. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

L. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

## 2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Primers: Provide primers that comply with Division 09 painting sections.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

E. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than eight (8) inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacture**r**. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition shop drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with primer specified in Section 09 91 23 where indicated.

## 2.8 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with zinc-rich primer.

## 2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

## 2.10 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two (2) integrally welded steel strap anchors for embedding in concrete.

## 2.11 FINISHES, GENERAL

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

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.12 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153 for steel and iron hardware and with ASTM A123 for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.13 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

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 no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two (2) coats of clear lacquer.

## 3.2 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.

B. Anchor supports for operable partitions 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 for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" article.

D. Install pipe or tube columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

## 3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

## 3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

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 SECTION INCLUDES

A. Wood blocking and nailers.

B. Wood furring and grounds.

C. Plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of two (2) inches nominal or greater but less than five (5) inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.

3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

C. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.6 DELIVERY, STORAGE AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship**."**

1. Dimension lumber framing.
2. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. Application: Treat items indicated on Drawings, and the following:
1. Concealed blocking.
2. Roof construction.
3. Plywood backing panels.

## 2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Furring.
4. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

## 2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

G. 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 assemblies and equal to four (4) times the load imposed when

installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring] nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

E. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD GROUND**,** BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

## 3.3 PROTECTION

A. Protect rough carpentry from weather.

END OF SECTION

# 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 SECTION INCLUDES

A. Wood cabinets.

B. Solid-surfacing-material.

C. Closet and utility shelving.

## 1.3 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

## 1.4 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated**,** including cabinet hardware and accessories, finishing materials and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other sections.
   2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets and other items installed in architectural woodwork.
   3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

D. Samples for Verification:
   1. Veneer-faced panel products with or for transparent finish, 8 by 10 inches, for each species and cut. Include at least one (1) face-veneer seam and finish as specified.
   2. Solid-surfacing materials, six (6) inches square.
   3. Exposed cabinet hardware and accessories, one (1) unit for each type and finish.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

G. Qualification Data: For installer and fabricator.

## 1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

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

E. Preinstallation Conference: Conduct conference at project site to comply with requirements in Section 01 31 00.

## 1.7 DELIVERY, STORAGE AND HANDLING

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

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork 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 woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on shop drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.9 COORDINATION

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

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Species and Cut for Transparent Finish: Cherry to match Architects sample.

C. Wood Products: Comply with the following:
1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD.
3. Particleboard: ANSI A208.1, Grade M-2.
4. Softwood Plywood: DOC PS 1.
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

D. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semi-exposed edges.

E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

    a. Avonite, Inc.
    b. E. I. du Pont de Nemours and Company.
    c. Nevamar Company, LLC; Decorative Products Div.
    d. Swan Corporation (The).
    e. Wilsonart International; Div. of Premark International, Inc.

3. Type: Standard type unless Special Purpose type is indicated.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Section 08 71 11.

B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch thick metal, and as follows:

    1. Semi-concealed Hinges for Flush Doors: BHMA A156.9, B01361.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening**,** self-closing.

D. Back-Mounted Pulls: BHMA A156.9, B02011.

E. Catches: Magnetic catches, BHMA A156.9, B03141.

F. Shelf Rests: BHMA A156.9, B04013; metal.

G. Drawer Slides: BHMA A156.9, B05091.
    1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
    2. Trash Bin Slides: Grade 1HD-100; for trash bins not more than 20 inches high and 16 inches wide.

H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
    1. Satin Stainless Steel: BHMA 630.

I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.3 MISCELLANEOUS 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. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

C. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Contact Adhesive: 250 g/L.

## 2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

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

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

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4-Inch Thick or Less: 1/16-inch.
2. Edges of Rails and Similar Members More Than 3/4-Inch Thick: 1/8-inch.
3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16-inch.

E. Complete fabrication, including assembly**,** finishing**,** and hardware application, to maximum extent possible before shipment to project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven (7) days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on shop drawings before disassembling for shipment.

F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## 2.5 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Wood Species and Cut for Exposed Surfaces: Cherry to match Architects sample.

1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
2. Matching of Veneer Leaves: Book match.
3. Vertical Matching of Veneer Leaves: End match.
4. Veneer Matching within Panel Face: Running match.

D. Semi-exposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

## 2.6 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Premium.

B. Solid-Surfacing-Material Thickness: 1/2-inch.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As selected by Architect from manufacturer's full range.

D. Fabricate tops in one (1) piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application.
3. Fabricate backsplash inside and outside corners with mitered edges. Sand and smooth edges so there are no rough or sharp edges.

E. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

## 2.7 CLOSET AND UTILITY SHELVING

A. Grade: Premium.

B. Shelf Material: 3/4-inch thermoset decorative panel with PVC or polyester edge banding.

C. Cleats: 3/4-inch thermoset decorative panel.

## 2.8 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this section. Refer to Division 09 painting sections for finishing opaque-finished architectural woodwork.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one (1) coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two (2) coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

D. Transparent Finish:

1. Grade: Premium.
2. AWI Finish System: Catalyzed lacquers
3. Staining: Match Architect's sample.
4. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.

5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

# PART 3 - EXECUTION

## 3.1 PREPARATION

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

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

## 3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8-inch in 96 inches.

D. 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. Install cabinets with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8-inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Section 07 92 00.

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

## 3.3 ADJUSTING AND CLEANING

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

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

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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 SECTION INCLUDES

A. Decorative plastic resin panels in vertical and horizontal applications.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. High Performance Building Documentation Submittals::
1. Product Data for products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

D. Submit product test reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.

1. Test reports required are:
a. Rate of Burning (ASTM D 635)
b. Self-Ignition Temperature (ASTM D 1929)
c. Density of Smoke (ASTM D 2843)

E. Samples for Verification: For plastic paneling and attachment hardware, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

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

## 1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURER

A. -of-Design Product: Subject to compliance with requirements, provide the product specified or a product of another manufacturer of equal or better quality and performance as approved by the Architect:

1. Basis of Design Product: 3form, Inc. Varia Ecoresin –Play-Mica Max.

B. Substitutions may be submitted in compliance with requirements in Section 01 60 00, and must meet Architects approval.

## 2.2 DECORATIVE PLASTIC PANELS – SS-1

A. Varia™ produced from ecoresin Play-Mica Max Sheet.

1. Engineered polyester resin
2. Sheet Size: Maximum 4’ x 10’
3. Thickness: Minimum 1/2”

B. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.

C. Sheet minimum performance attributes:

1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650°F.
3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 75%.

4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450) at thickness of 1".
5. Room Corner Burn Test (NFPA 286). Material must meet Class A criteria at ¼" thickness as described by the 2003 *International Building Code*.
6. Extent of Burning (UL 94). Must submit UL card.
7. Impact strength. Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (for durability, shipping, installation, and use).
8. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004 at 1/8" thickness.
9. UPITT Test for Combustion Product Toxicity: Product must be recorded as "not more toxic than wood".
10. Dynamic environmental testing (ASTM standards D 5116 and D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality certified.
11. Panels must be produced from a minimum of 40% post-industrial recycle content. This recycle content must be certified by a recognized party certification group, such as Scientific Certification Systems (SCS).
12. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
13. New York Department of Buildings (Product must have an MEA [Materials and Equipment Acceptance] number) for use as Interior Finishes

## 2.3 FABRICATION

A. General: Fabricate Plastic Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings, additional fabrication and installation details can be found on the 3form Partner Preliminary Project Review, if applicable.

B. Comply with manufacturer's written recommendations for fabrication.

C. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.

1. Sawing: Select equipment and blades suitable for type of cut required.
2. Drilling: Drills specifically designed for use with plastic products.
3. Routing.
4. Tapping

D. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.

1. Cold Bending.
2. Hot Bending.
3. Thermoforming: Acceptable only on uncoated material.
4. Drape Forming
5. Matched Mold Forming.
6. Mechanical Forming.

7. Laminating: Laminate to substrates indicated using adhesives and techniques recommended by manufacturer.

## 2.4 MISCELLANEOUS MATERIALS

A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaner: Type recommended by manufacturer.

C. Fasteners: Use screws designed specifically for plastics. Self threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly such as light fixtures.

D. Bonding Cements: May be achieved with solvents or adhesives, suitable for use with product and application.

## 2.5 MOUNTING HARDWARE

A. -of-Design Product: Subject to compliance with requirements, provide the product specified or a product of another manufacturer of equal or better quality and performance as approved by the Architect:

1. Basis of Design Product: 3form, Inc.

B. Substitutions may be submitted in compliance with requirements in Section 01 60 00, and must meet Architects approval.

C. Mounting Hardware Systems: (Refer to drawings to determine if required)

1. 3form POINT Support System.
   a. Stainless Steel Standoff; 1-inch diameter, 1-inch barrel length.
   b. Standard ½-inch cap.

D. Provide all mounting hardware system components required for a complete installation. Comply with manufacturers recommendations for each system type. Refer to drawings for mounting details. Coordinate mounting hardware with panel type.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with

requirements specified. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for the installation of Plastic Fabrications. Sizes, profiles and other characteristics are indicated on the drawings, additional installation details can be found on the 3form Partner Preliminary Project Review, if applicable.

B. Manufacturer's shop to fabricate items to the greatest degree possible.

C. Installation should be performed by an authorized 3form Partner, if available.

D. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.

E. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

F. Form field joints using manufacturer's recommended procedures.

G. Locate seams in panels so that they are not directly in line with seams in substrates.

END OF SECTION

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# 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 SECTION INCLUDES

A. Foam plastic board insulation.

B. Glass fiber blanket insulation.

C. Sound attenuation insulation.

## 1.3 RELATED SECTIONS

A. Section 09 29 00 - Gypsum Board: Installation in metal-framed assemblies of insulation specified by referencing this section.

B. Section 22 07 00 - Plumbing Insulation.

C. Section 23 07 00 - HVAC Insulation.

## 1.4 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Samples for Verification: Full-size units for each type of exposed insulation indicated.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

E. Research/Evaluation Reports: For foam-plastic insulation.

## 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one (1) source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   1. Surface-Burning Characteristics: ASTM E84.
   2. Fire-Resistance Ratings: ASTM E119.
   3. Combustion Characteristics: ASTM E136.

C. Recycled Content: No LEED Credit required for this project.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

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

## 2.2 FOAM PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

   1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

      a. DiversiFoam Products: CertiFoam 15 SE.
      b. Dow Chemical Company (The): Styrofoam CavityMate Butt Edge.
      c. Owens Corning: Foamular CW 15 Square Edge.
   2. Type X, 15 psi.

3. Location: Concealed wall installations where high compressive resistance is not required.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

## 2.3 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers:
1. CertainTeed Corporation.
2. Guardian Fiberglass, Inc.
3. Johns Manville.
4. Knauf Fiber Glass.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

C. Faced, Glass-Fiber Blanket Insulation: ASTM C665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one (1) face.

D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
1. 3-5/8-inches thick with a thermal resistance of 11 degrees F x h x sq ft/Btu at 75 degrees F.
2. 5-1/2-inches thick with a thermal resistance of 19 degrees F x h x sq ft/Btu at 75 degrees F.
3. 6-1/2-inches thick with a thermal resistance of 21 degrees F x h x sq ft/Btu at 75 degrees F.
4. 10 inches thick with a thermal resistance of 30 degrees F x h x sq ft/Btu at 75 degrees F.

E. Location: Concealed areas requiring thermal insulation.

## 2.4 SOUND ATTENUATION BLANKETS

A. Sound Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing). Made of mineral fiber material manufactured from slag wool, or rock wool. Product shall not contain asbestos. Nominal Density 2.5 pcf.

B. Flame Spread: ASTM E84; 0

C. Smoke Development: ASTM E84; 0.

D. Location: Refer to drawings for location of wall type assemblies requiring sound attenuation.

## 2.5 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

## 2.6 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
   1. Available Products:
      a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
      b. Eckel Industries of Canada; Stic-Klip Type N Fasteners.
      c. Gemco; Spindle Type.
   2. Plate: Perforated galvanized carbon-steel sheet, 0.030-inch thick by two (2) inches square.
   3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105-inch in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
   1. Available Products:
      a. Gemco; 90-Degree Insulation Hangers.
   2. Angle: Formed from 0.030-inch thick, perforated, galvanized carbon-steel sheet with each leg two (2) inches square.
   3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
   1. Available Products:
      a. AGM Industries, Inc.; RC150.
      b. AGM Industries, Inc.; SC150.
      c. Gemco; Dome-Cap.
      d. Gemco; R-150.
      e. Gemco; S-150.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space indicated on drawings between face of insulation and substrate to which anchor is attached.
   1. Available Products:
      a. Gemco; Clutch Clip.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
   1. Available Products:
      a. AGM Industries, Inc.; TACTOO Adhesive.
      b. Eckel Industries of Canada; Stic-Klip Type S Adhesive.
      c. Gemco; Tuff Bond Hanger Adhesive.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements of sections in which substrates and related work are specified and for other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

### 3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated 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. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, 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.

## 3.4 INSTALLATION OF GENERAL BUILDING INSULATION

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. Install mineral-fiber insulation 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 (1) length is required to fill cavity, 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.

C. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu ft.

## 3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Ceiling overlayment application: Install SAFB over ceiling panels in single or double layers for a total thickness of 3 inches, and extending 48 inches beyond all partitions and tightly fit around all hangers and other vertical penetrations.

## 3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

# 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 SECTION INCLUDES

A. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

## 1.3 RELATED SECTIONS

A. Section 07 84 46 - Fire-Resistive Joint Systems.

B. Division 21 sections specifying fire-suppression piping penetrations.

C. Division 22 and 23 sections specifying duct and piping penetrations.

D. Division 26, 27, and 28 sections specifying cable and conduit penetrations.

## 1.4 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 E814:

1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

    a. Penetrations located outside wall cavities.
    b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding four (4) inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

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 E84.

E. Fire Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for through-penetration firestop systems tested per ASTM E119.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

D. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

E. Qualification Data: For installer.

F. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.

G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful performance. Manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to installer engaged by Contractor does not in itself confer qualification on buyer.

B. Installation Responsibility: Assign installation of through-penetration firestop systems in project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one (1) source from a single manufacturer.

D. 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 complying with the following requirements:

    a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

        1) UL in its "Fire Resistance Directory."

E. Preinstallation Conference: Conduct conference at project site to comply with requirements in Section 01 31 00.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to project, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

## 1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one (1) of the through-penetration firestop systems indicated for each application that are produced by one (1) of the following manufacturers:

1. Hilti, Inc.
2. 3M; Fire Protection Products Division.
3. Tremco; Sealant/Weatherproofing Division.

## 2.2 FIRESTOPPING, GENERAL

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. Firestopping products shall be manufactured within, and contain raw materials extracted within, 500 miles of the project site where feasible.

C. 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. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
    a. Slag-/rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.
2. Substrate primers.
3. Collars.
4. Steel sleeves.

## 2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Non-hardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at project site to form a non-shrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
2. VOC Content of Sealants: Provide sealants and sealant primers for use in conjunction with sheet metal flashing and trim products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

    a. Architectural Sealants: 250 g/L.
    b. Sealant Primers for Nonporous Substrates: 250 g/L.
    c. Sealant Primers for Porous Substrates: 775 g/L.

## 2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

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

### 3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

### 3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within six (6) inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

## 3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

## 3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

## 3.7 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. Firestop Systems with No Penetrating Items:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Mortar.

C. Firestop Systems for Metallic Pipes, Conduit, or Tubing:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Mortar.

D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing:

1. Type of Fill Materials: One or more of the following:

a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Intumescent wrap strips.
e. Firestop device.

E. Firestop Systems for Electrical Cables:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Silicone sealant.
c. Intumescent putty.
d. Silicone foam.
e. Pillows/bags.

F. Firestop Systems for Cable Trays:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Intumescent putty.
c. Silicone foam.
d. Pillows/bags.
e. Mortar.

G. Firestop Systems for Insulated Pipes:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Intumescent putty.
c. Silicone foam.
d. Intumescent wrap strips.

H. Firestop Systems for Miscellaneous Electrical Penetrants:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Intumescent putty.
c. Mortar.

I. Firestop Systems for Miscellaneous Mechanical Penetrants:

1. Type of Fill Materials: One (1) or both of the following:

a. Latex sealant.
b. Mortar.

J. Firestop Systems for Groupings of Penetrants:

1. Type of Fill Materials: One (1) or more of the following:

a. Latex sealant.
b. Mortar.
c. Intumescent wrap strips.
d. Firestop device.
e. Intumescent composite sheet.

END OF SECTION

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# 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 SECTION INCLUDES

A. Joints in or between fire-resistance-rated constructions.

## 1.3 RELATED SECTIONS

A. Section 07 84 13 - Penetration Firestopping: Penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

B. Section 07 95 00 - Expansion Control: Fire-resistive architectural joint systems.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

D. Qualification Data: For qualified installer.

E. Installer Certificates: From installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint

system products to Contractor or to installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

a. Fire-resistive joint system products bear classification marking of qualified testing agency.
b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at project site.

## 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

## 1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint 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 assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

C. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Grace Construction Products.
   b. Hilti, Inc.
   c. 3M Fire Protection Products.
   d. Tremco, Inc.; Tremco Fire Protection Systems Group.

D. Joints in Smoke Barriers: Provide fire-resistive joint systems with ratings determined per UL 2079.

1. L-Rating: Not exceeding 5.0 cfm/ft of joint at 0.30 inch wg at both ambient and elevated temperatures.
2. Manufacturers: Subject to compliance with requirements, [**provide products by one (1) of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

   a. A/D Fire Protection Systems Inc.
   b. Grace Construction Products.
   c. Hilti, Inc.
   d. Johns Manville.
   e. Nelson Firestop Products.
   f. NUCO Inc.
   g. Passive Fire Protection Partners.
   h. RectorSeal Corporation.
   i. Specified Technologies Inc.
   j. 3M Fire Protection Products.

k. Tremco, Inc.; Tremco Fire Protection Systems Group.
l. USG Corporation.
m. [**Insert manufacturer's name**].

E. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

F. VOC Content: Provide fire-resistive joint systems that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

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

### 3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

## 3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in 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 fire-resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

## 3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within six (6) inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

## 3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

## 3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

## 3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.

B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly and an Exterior Curtain-Wall Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG
   1. .

C. Head-of-Wall Fire-Resistive Joint Systems:
   1. Assembly Rating: one (1) and Two (2) hours.
   2. Nominal Joint Width: As indicated.
   3. Movement Capabilities: 25% percent compression or extension.

END OF SECTION

# 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 SECTION INCLUDES

A. Silicone joint sealants.

B. Urethane joint sealants.

C. Latex joint sealants.

D. Solvent-release-curing joint sealants.

E. Preformed joint sealants.

F. Acoustical joint sealants.

## 1.3 RELATED SECTIONS

A. Section 07 84 46 - Fire-Resistive Joint Systems: Sealing joints in fire-resistance-rated construction.

B. Section 07 95 00 - Expansion Control: Building expansion joints.

C. Section 08 80 00 - Glazing: Glazing sealants.

D. Section 09 29 00 - Gypsum Board: Sealing perimeter joints.

E. Section 09 30 00 - Tiling: Sealing tile joints.

F. Section 09 51 13 - Acoustical Panel Ceilings -: Sealing edge moldings at perimeters with acoustical sealant.

## 1.4 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to project joint substrates as follows:
   1. Locate test joints where indicated on project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:

a. Each kind of sealant and joint substrate indicated.
b. For each sealant, test with and with-out required primer.

3. Notify Architect seven (7) days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
   a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one (1) side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each joint-sealant product indicated.

C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

D. Samples for Verification: For each kind and color of joint sealant required, provide samples with joint sealants in 1/2-inch wide joints formed between two (2) 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

E. 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.

F. Qualification Data: For qualified installer and testing agency.

G. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

I. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

J. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" article.

K. Field-Adhesion Test Reports: For each sealant application tested.

L. Warranties: Sample of special warranties.

## 1.6 QUALITY ASSURANCE

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

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other sections that are indicated to receive joint sealants specified in this section. Use materials and installation methods specified in this section.

E. Preinstallation Conference: Conduct conference at project site.

## 1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.8 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 (2) 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: Polyurethane 5 years / silicone 20 years.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

# PART 2 - PRODUCTS

## 2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one (1) another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
   1. VOC Content of Interior Sealants: No LEED Credits required for this project.

B. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 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 non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 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.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 2.2 SILICONE JOINT SEALANTS

A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 790.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. Pecora Corporation; 301 NS.
      d. Tremco Incorporated; Spectrem 1.

B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation;NS Parking Structure Sealant.
      b. May National Associates, Inc.; Bondaflex Sil 728 NS.
      c. Pecora Corporation; 311 NS.
      d. Tremco Incorporated; Spectrem 800.

C. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following::
      a. BASF Building Systems; Omniplus.
      b. Dow Corning Corporation; 786 Mildew Resistant.
      c. GE Advanced Materials - Silicones; Sanitary SCS1700.
      d. Tremco Incorporated; Tremsil 200 Sanitary.

D. One (1)-Part, Mildew-Resistant Silicone Sealant: ASTM C920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

   1. : Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Corning Corporation; Dow Corning 786.
      b. Silicones; a division of GE Specialty Materials; Sanitary 1700.
      c. International, Inc.; Latasil Tile & Stone Sealant.
      d. Corporation; Pecora 898 Sanitary Silicone Sealant.
      e. Incorporated; Tremsil 600 White

## 2.3 URETHANE JOINT SEALANTS

A. Single-Component, Non-sag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Pacific Polymers International, Inc.; Elasto-Thane 230 LM Type II.
      b. Polymeric Systems, Inc.; PSI-901.
      c. Tremco Incorporated, Dymonic FC.

B. Multicomponent, Non-sag, Traffic-Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 50, for Use T.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Polymeric Systems, Inc.; PSI-270.
      b. Tremco Incorporated; Dymeric 240 / 240FC.

## 2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. BASF Building Systems; Sonolac.
      b. Bostik, Inc.; Chem-Calk 600.
      c. May National Associates, Inc.; Bondaflex 600.
      d. Pecora Corporation; AC-20+.
      e. Tremco Incorporated; Tremflex 834.

## 2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealant: ASTM C1311.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Bostik, Inc.; Chem-Calk 300.
      b. Pecora Corporation; BC-158.
      c. Tremco Incorporated; Tremco Butyl Sealant.

## 2.6 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 123 Silicone Seal.
      b. GE Advanced Materials - Silicones; UltraSpan US1100.
      c. May National Associates, Inc.; Bondaflex Silbridge 300.

d. Pecora Corporation; Sil-Span.
e. Sealex, Inc.; ImmerBond.
f. Tremco Incorporated, Proglaze ETA.

B. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one (1) side with a pressure-sensitive adhesive and covered with protective wrapping.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Dayton Superior Specialty Chemicals; Polytite Standard.
b. EMSEAL Joint Systems, Ltd.; Emseal 25V.
c. Sandell Manufacturing Co., Inc.; Polyseal.
d. Schul International, Inc.; Sealtite.
e. Tremco Incorporated, illmod 600.

## 2.7 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard Non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Pecora Corporation; AC-20 FTR.
b. Tremco Incorporated, Acoustical Sealant.
c. USG Corporation; SHEETROCK Acoustical Sealant.

## 2.8 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.9 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, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

## 3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
      d. Exterior insulation and finish systems.
   3. Remove laitance and form-release agents from concrete.
   4. 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. Nonporous joint substrates include the following:
      a. Metal.

b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

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.

## 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. 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.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. 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.

F. Tooling of Non-sag 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 C1193, unless otherwise indicated.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
   1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
   2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
   3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
   4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations.

## 3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      b. Perform one (1) test for each 1000 feet of joint length thereafter or one (1) test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one (1) side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to

determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

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.

## 3.5 CLEANING

A. 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.

## 3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

## 3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in stone flooring.
      c. Control and expansion joints in brick flooring.
      d. Control and expansion joints in tile flooring.
      e. Other joints as indicated.
   2. Silicone Joint Sealant: Single component, Non-sag, traffic grade, neutral curing.
   3. Urethane Joint Sealant: Multicomponent, Non-sag, traffic grade, Class 50.
   4. Preformed Joint Sealant: Preformed foam.
   5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces.

1. Joint Locations:
    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Vertical joints on exposed surfaces of interior unit masonry, concrete walls, and partitions.
    e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    f. Other joints as indicated.
2. Joint Sealant: Acrylic latex - siliconized based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Sealant Location:
    a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    b. Tile control and expansion joints where indicated.
    c. Other joints as indicated.
2. Joint Sealant: Single component, Non-sag, mildew resistant, acid curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal non-traffic surfaces.
1. Joint Location:
    a. Acoustical joints where indicated.
    b. Other joints as indicated.
2. Joint Sealant: Acoustical. Standard non-sag, paintable, non staining latex sealant.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

# 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 SECTION INCLUDES

A. Standard hollow metal doors and frames.

## 1.3 RELATED SECTIONS

A. Section 08 14 16 – Flush Wood Doors: Wood doors set in metal frames.

B. Section 08 71 00 - Door Hardware: Door hardware for hollow metal doors.

C. Section 08 80 00 – Glazing: Glazed lites in steel door and frames.

D. Sections 09 91 00 – Painting: Field painting hollow metal doors and frames.

E. Division 26 sections for electrical connections including conduit and wiring for door controls and operators.

## 1.4 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

## 1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C.

C. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

D. Preinstallation Conference: Conduct conference at project site.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and project-site storage. Do not use non-vented plastic.

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

B. Deliver welded frames with two (2) removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at project site. Place in stacks of five (5) units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

## 1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.9 COORDINATION

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

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

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

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group Company.
4. Curries Company; an ASSA ABLOY Group Company.

## 2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

D. Frame Anchors: ASTM A591, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008 or ASTM A1011, hot-dip galvanized according to ASTM A153, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153.

F. 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 hollow metal frames of type indicated.

G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C143.

H. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu ft density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 08 80 00.

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
    b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 degrees F x h x sq ft/Btu when tested according to ASTM C1363.

        1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Beveled edge.

    a. Beveled Edge: 1/8-inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.
6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

## 2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: 0.053-inch thick steel sheet.
4. Frames for Wood Doors: 0.053-inch thick steel sheet.
5. Frames for Borrowed Lights: Same as adjacent door frame.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

## 2.5 FRAME ANCHORS

A. Jamb Anchors:

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

B. Floor Anchors: Formed from same material as frames, not less than 0.042-inch thick, and as follows:

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

## 2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

## 2.7 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032-inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8-inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032-inch thick, fabricated from same material as frames in which they are installed.

## 2.8 LOUVERS

A. Provide 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.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

## 2.9 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch thick by 1-inch wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016-inch thick.

## 2.10 FABRICATION

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

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:
1. Glazed Lites: Factory cut openings in doors.

2. Astragals: Provide overlapping astragal on one (1) leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4-inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four (4) spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two (2) anchors per jamb up to 60 inches high.
        2) Three (3) anchors per jamb from 60 to 90 inches high.
        3) Four (4) anchors per jamb from 90 to 120 inches high.
        4) Four (4) anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three (3) anchors per jamb up to 60 inches high.
        2) Four (4) anchors per jamb from 60 to 90 inches high.
        3) Five (5) anchors per jamb from 90 to 96 inches high.
        4) Five (5) anchors per jamb plus one (1) additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two (2) anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two (2) anchors in each jamb.
    d. Post-installed Expansion Type: Locate anchors not more than six (6) inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

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

a. Single-Door Frames: Drill stop in strike jamb to receive three (3) door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two (2) door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 08 80 00.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

## 2.11 STEEL 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 door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with non-petroleum 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 apply galvanizing repair paint specified below to comply with ASTM A780.
1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

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

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

### 3.2 PREPARATION

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

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16-inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16-inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16-inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16-inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

## 3.3 INSTALLATION

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

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

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

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

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

    a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on shop drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

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

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8-inch plus or minus 1/16-inch.
    b. Between Edges of Pairs of Doors: 1/8-inch plus or minus 1/16-inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8-inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4-inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Section 08 80 00 and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than nine (9) inches o.c. and not more than two (2) inches o.c. from each corner.

## 3.4 ADJUSTING AND CLEANING

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

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

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

END OF SECTION

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# 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 SECTION INCLUDES

A. Solid-core doors wood veneer faces.

B. Factory finishing flush wood doors.

C. Factory machining for hardware.

## 1.3 RELATED SECTIONS

A. Section 08 11 13 – Hollow Metal Doors and Frames: Wood doors set in metal frames.

B. Section 08 80 00 - Glazing: Glass view panels in flush wood doors.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in product data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. Provide set of three (3) samples showing typical range of color and grain to be expected in the finished work.

2. Louver blade and frame sections, six (6) inches long, for each material and finish specified.

E. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

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

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C.

D. Preinstallation Conference: Conduct conference at project site.

1.6 DELIVERY, STORAGE AND HANDLING

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

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

C. Mark each door on top and bottom rail with opening number used on shop drawings.

1.7 PROJECT CONDITIONS

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

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

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

a. Warping (bow, cup, or twist) more than 1/4-inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01-inch in a 3-inch span.

2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Algoma Hardwoods, Inc.
2. Ampco, Inc.
3. Eggers Industries.
4. Graham; an Assa Abloy Group company.
5. Marshfield Door Systems, Inc.
6. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.
2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, locker rooms.
3. Standard Duty: Closets (not including janitor's closets), private toilets.

C. Structural-Composite-Lumber-Core Doors:

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

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

E. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Core Reinforcement Blocking: Provide core reinforcement blocking in all single, or paired 1-1/2, 1, and 3/4 hour fire rated doors where surface mounted closers or fire exit devices are to be attached to the door.

   a. -inch top-rail blocking.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
   c. 5-inch midrail blocking, in doors indicated to have armor plates.
   d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

## 2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Select white maple.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Exposed Vertical and Top Edges: Same species as faces.

## 2.4 LOUVERS AND LIGHT FRAMES

A. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.

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

1. Wood Species: Species compatible with door faces.
2. Profile: Manufacturer's standard shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

C. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

## 2.5 FABRICATION

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

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

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. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00.
3. Louvers: Factory install louvers in prepared openings.

## 2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four (4) edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining: Match Architects sample.
4. Sheen: Satin.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

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

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

## 3.2 INSTALLATION

A. Hardware: For installation, see Section 08 71 00.

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

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

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

1. Clearances: Provide 1/8-inch at heads, jambs, and between pairs of doors. Provide 1/8-inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4-inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8-inch in two (2) inches at lock and hinge edges.
3. Bevel fire-rated doors 1/8-inch in two (2) inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Fire Rated Doors; Align in frames for uniform clearance at each edge.

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

## 3.3 ADJUSTING

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

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

END OF SECTION

# 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 SECTION INCLUCES

A. Access doors and frames for walls and ceilings.

## 1.3 RELATED SECTIONS

A. Section 09 51 13 - Acoustical Panel Ceilings: Suspended acoustical panel ceilings.

B. Section 09 29 00 – Gypsum Board: Walls and Ceilings

C. Division 21 – Fire Suppression: Coordinate access door locations where needed for sprinkler valve access.

D. Division 22 – Plumbing: Coordinate access door locations where needed for plumbing valve access.

E. Division 23 – HVAC: Coordinate access door locations for HVAC system access.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

C. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

E. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

F. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers,

grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

## 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door(s) and frame(s) through one (1) source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame 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. UL 10B for vertical access doors and frames.
2. UL 263 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

## 1.6 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" article.

# PART 2 - PRODUCTS

## 2.1 STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A36.

1. ASTM A123, for galvanizing steel and iron products.
2. ASTM A153, for galvanizing steel and iron hardware.

C. Rolled-Steel Floor Plate: ASTM A786, rolled from plate complying with ASTM A36 or ASTM A283, Grade C or D.

1. ASTM A123, for galvanizing steel and iron products
2. ASTM A153, for galvanizing steel and iron hardware.

D. Steel Sheet: electrolytic zinc-coated, ASTM A591 with cold-rolled steel sheet substrate complying with ASTM A1008, Commercial Steel (CS), exposed.

E. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A924.

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

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."

2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

G. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

## 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 (1) of the following:

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Dur-Red Products.
4. Karp Associates, Inc.
5. Milcor Inc.
6. Nelson Industrial, Inc.
7. Nystrom.

C. Medium-Security, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.105-inch thick sheet metal, flush construction.
3. Frame: Minimum 0.105-inch thick sheet metal with 1-inch wide, surface-mounted trim.
4. Hinges: Concealed continuous.
5. Lock: Flush cylinder lock and key.

D. Fire-Rated, Insulated, Medium-Security, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 degrees F at the end of 30 minutes.
4. Door: Flush panel with a core of 2-inch thick, mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.075 inch.
5. Frame: Minimum 0.060-inch thick sheet metal with 1-inch wide, surface-mounted trim.
6. Hinges: Concealed continuous.
7. Automatic Closer: Spring type.
8. Lock: Flush cylinder lock and key.

## 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 in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

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.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. Provide mounting holes in frames for attachment of units to metal or wood framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two (2) 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

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes

1. Furnishing and installation of all mechanical and electrical finish hardware necessary for all doors and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

B. Related Sections

1. Division 8 Section - Hollow Metal Doors and Frames
2. Division 8 Section – Flush Wood Doors
3. Division 26 Section - Electrical

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

1. Windows
2. Cabinets of all kinds, including open wall shelving and locks.
3. Signage, except as noted.
4. Complete toilet accessories including coat hooks, unless note otherwise.
5. Overhead doors, unless noted otherwise

1.03 REFERENCES

A. Applicable state and local building codes and standards.

B. FIRE/LIFE SAFETY

1. NFPA - National Fire Protection Association
   a. NFPA 70 – National Electric Code
   b. NFPA 80 - Standard for Fire Doors and Fire Windows
   c. NFPA 101 - Life Safety Code
   d. NFPA 105 - Smoke and Draft Control Door Assemblies
2. State Fire Safety Code and Amendments to CT Supplement

C. UL - Underwriters Laboratories

1. UL 10C - Positive Pressure Test of Fire Door Assemblies
2. UL 1784 - Air Leakage Tests of Door Assemblies
3. UL 305 - Panic Hardware

D. Accessibility

1. ADA - Americans with Disabilities Act
2. ICC (CABO) / ANSI A117.1 - Accessible and Usable Buildings and Facilities

E. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware

F. ANSI - American National Standards Institute

1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements. Prior to submittal field verify existing doors and/or frames receiving new hardware and/or existing conditions receiving new openings. Verify new hardware is compatible with the existing door/frame preparation and/or existing conditions. Advise architect within the submittal package of incompatibility or issues.

B. Catalog Cuts: 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.

C. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:

1. Door Index; include door number, heading number, and Architects hardware set number.
2. Opening Lock Function Spreadsheet; list locking device and function for each opening.
3. Type, style, function, size, and finish of each hardware item.
4. Name and manufacturer of each item.
5. Fastenings and other pertinent information.
6. Location of each hardware set cross-referenced to indications on Drawings.
7. Explanation of all abbreviations, symbols, and codes contained in schedule.
8. Mounting locations for hardware.
9. Door and frame sizes and materials.

10. Name and phone number for the local manufacturer's representative for each product.
11. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and/or fire/smoke alarm connection.

D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. Utilize ANSI A156.28 “Recommended Practices for Keying Systems” as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.

E. Samples: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.

1. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.

F. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

G. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit riser and wiring diagrams as required for the proper installation of complete electrical, electromechanical, and electromagnetic products.

H. Operations and Maintenance Data: Provide in accordance with Division 1 and include the following:

1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
2. Catalog pages for each product.
3. Name, address, and phone number of local representative for each manufacturer.
4. Parts list for each product.
5. Copy of final approved hardware schedule, edited to reflect “As installed.”
6. Copy of final keying schedule.
7. As installed “Wiring Diagrams” for each opening connected to power, both low voltage and 110 volts.
8. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
9. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

I. Certificates of Compliance: Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.

## 1.05 QUALITY ASSURANCE

A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 1 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.

B. Supplier Qualifications: A recognized architectural 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 provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.

C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.

D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwrites Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

E. Electronic Security Hardware: When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

## 1.06 DELIVERY, STORAGE, AND HANDLING

A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.

B. Each article of hardware shall be individually packaged in manufacturer's original packaging.

C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.

E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. No direct shipments will be allowed unless approved by the Contractor.

1.07 WARRANTY

A. Provide manufacturer's warrantees as specified in Division 1 and as follows:

1. Closers: 10 years, except electronic closers, 2 years.
2. Exit Devices: 3 years, except electrified devices, 1 year.
3. Locksets: 3 years.
4. Continuous Hinges: Lifetime warranty.
5. Other hardware: 1 year.

B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.

C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

1.08 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.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.

B. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

| Item | Scheduled Manufacturer | Acceptable Substitute |
|---|---|---|
| Hinges | McKinney (McK) | Hager, Stanley |
| Electric Power Transfer | Von Duprin (VON) | Adams-Rite, Falcon |
| Pivots | Rixson (RIX) | Dorma, Ives |
| Flush Bolts | Ives (IVE) | Burns, Rockwood |
| Locksets | Best (Best) | Falcon, Sargent |
| Exit Devices | Von Duprin (VON) | Precision, Sargent |
| Power Supplies | Von Duprin (VON) | Dynalock, Security Door Controls |
| Door Closers | Corbin Russwin (CORU) | Norton, Stanley |

| | | |
|---|---|---|
| Electro-Mechanical Automatic Operators | Falcon (FAL) | Gyro-Tech, Horton |
| Door Trim | Best (Best) | Burns, Rockwood |
| Protection Plates | Ives (IVE) | Burns, Rockwood |
| Overhead Stops | Rixson (RIX) | Glynwood, Sargent |
| Stops & Holders | Rixson (RIX) | Burns, Rockwood |
| Thresholds & Weatherstrip | National Guard Products (NGP) | Reese, Zero |
| Silencers | Rockwood (RWD) | Burns, Ives |
| Cylinders & Keying | Best (Best) | Schlage, Sargent |

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.02 MATERIALS

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.
4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges

1. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:
   a. 1-3/4 inch thick doors, up to and including 36 inches wide:
      Exterior: standard weight, stainless steel, 4-1/2 inches high
      Interior: standard weight, steel, 4-1/2 inches high
   b. 1-3/4 inch thick doors over 36 inches wide:
      Exterior: heavy weight, stainless steel, 5 inches high
      Interior: heavy weight, steel, 5 inches high
2. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.

3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins
4. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
5. Acceptable manufacturers and/or products: Ives 5BB series, Hager BB series, Stanley FBB Series.

C. Electric Power Transfer

1. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.
2. Electric power transfer is to be located per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.
3. Acceptable manufacturers and/or products: Von Duprin, Adams Rite, Falcon.

D. Pivot Sets

1. Provide pivot sets complete with oil-impregnated top pivot, unless indicated otherwise.
2. Where offset pivots are specified, Provide one intermediate pivot for doors less than 91 inches high and one additional intermediate pivot per leaf for each additional 30 inches in height or fraction there of. Intermediate pivots spaced equally not less than 25 inches or not more than 35 inches on center, for doors over 121 inches high.
3. Acceptable manufacturers and/or products: Ives, Dorma, Rixson.

E. Flush Bolts

1. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

F. Cylindrical Locks - Grade 1

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to 2.04 KEYING.
2. Provide locks with a standard 2-3/4 inches backset, unless noted otherwise, with a 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
3. Provide locksets with a separate anti-rotation throughbolts, and shall have no exposed screws. Levers shall operate independently, and shall have two external return spring cassettes mounted under roses to prevent lever sag.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.

5. Lever trim shall be solid cast levers without plastic inserts, and wrought roses on both sides. Locksets shall be thru-bolted to assure proper alignment.
   a. Lever design shall be Falcon Quantum
   b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
6. Acceptable manufacturers and/or products: Best 93K series, Falcon T series, Sargent 10-Line.

G. Exit Devices

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to 2.04 KEYING.
2. Exit devices shall be touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
3. Touchpad shall extend a minimum of one half of the door width. Touch-pad finish shall be compatible to exit device finish. Compression springs will be used in devices, latches, and outside trims or controls, tension springs also acceptable.
4. Devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
5. Provide manufacturer's standard strikes.
6. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
7. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
8. Non-fire-rated exit devices shall have cylinder dogging.
9. Removable mullions shall be a 2 inches x 3 inches steel tube. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
10. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
    a. Lever style will match the lever style of the locksets.
    b. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
11. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
12. Provide electrical options as scheduled.
13. Acceptable manufacturers and/or products: Falcon 24/25 series with deadlatching, Precision Apex series, Sargent 80 series with deadlatching.

H. Power Supplies

1. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.

2. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.
3. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.
4. Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.
5. Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.
6. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating “no delay” exiting mode.
7. Acceptable manufacturers and/or products: Von Duprin PS900 series, Dynalock 5000 series, Security Door Controls 600 series.

I. Door Closers

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with an aluminum cylinder. Closer body shall be 1-1/2 inch diameter, and heat-treated pinion journal shall be 11/16 inch diameter.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to 10 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C “positive pressure” fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
6. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.
7. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
8. Door closers meeting this specification: Falcon SC70 series, Norton 7500 series, Stanley D-4550 series.

J. Electro-Mechanical Automatic Operators

1. Electromechanical low-energy powered door operators, opening force not exceeding 14 lb-force (62 N). Shall conform to ANSI A156.19 ADA law, section 4.13.12' ANSI A117.1

a. UL 325 – Standard for Door, Drapery, Gate, Louver and Window Operators and Systems.
b. Operation: Push button, push plate, switch-activated, manual or field-programmable manual/electric power assisted Push 'N' Go opening. Comply with ANSI A156.19 and UL325.
c. Electro-mechanical, power open, spring closed design.
d. Adjustable manual opening force from 3 – 11 lbs.
e. Closing force 3 lb-force
f. Programmable control box and motor/gearbox: contained on formed metal mounted board, complete with integral end caps; precision-machined gears and bearing seats and all-weather lubricant, mounted on vibration isolators.
g. Design for surface-applied application. 26" compact header
h. Non-handed, reversible design can be used in push or pull operations, left or right.
i. Designed for interior or exterior application. Low to moderate traffic. Exterior application must be mounted on interior side to reduce exposure to weather.
j. Cover must be removable from front of the header for accessibility.
k. Fail-safe. In event of power failure, make door operate manually with controlled spring close as though equipped with a #3 manual door closer, closing force, 3 4 or 5 lbs. without damage to operator components.
l. Microprocessor control: 115 VAC. Do not use cam or reed microswitches.
m. Provide adjustment by microprocessor control for: Opening speed, Backcheck speed, Backcheck position, Hold open, from 0 to 15 seconds, Closing speed, Latch position
n. Built-in interface for electric strikes. (Note: for 12V AC @ 250 m-amps)
o. Interfaces with Power safety devices through built-in transformers.
p. Auto reverse on open. Door will encounter obstruction and remove force to allow the door to close
q. Push and go activated automatic door opening when manually opened
r. Integrated smart latch ensure latching by providing an additional variable force, closing force to overcome wind and or stack pressure conditions. Door position sensor allows easy manual push for additional safety
s. (2) LED lights illuminate to signal power to both control box and motor gear box. Provides easy trouble shooting to determine component errors.
t. Motor: DC permanent magnet motor with shielded ball bearings.
u. Door opening arm: Forged steel, attached at natural pivot point of door; do not use slide block in top of door.
v. Exposed arms: factory-polished and finished to match operator enclosure.
w. Service conditions: -34 degrees C, (-30 degrees F). and 71degrees C. (160 degrees F).
x. Finish of exposed headers: powder coated finish on metal base.

2. Acceptable manufacturers and/or products: Falcon 8200 Series, Gyro Tech, Horton.

K. Door Trim

1. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

L. Protection Plates

1. Provide kick plates, minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
   a. Kick Plates – 10 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

M. Overhead Stops

1. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for exterior and interior vestibule single acting doors.
2. Provide medium duty surface mounted overhead stop for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.
3. Acceptable manufacturers and/or products: Glynn-Johnson, Rixson, Sargent.

N. Door Stops and Holders

1. Provide door stops for all doors in accordance with the following requirements:
   a. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
   b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
   c. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

O. Thresholds, Seals, Door Sweeps, and Gasketing

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items as closely as possible. Size of thresholds shall be as follows:
   a. Exterior Saddle Thresholds – 1/2 inch high x jamb width x door width
   b. Interior Saddle Thresholds – ¼ inch high x jamb width x door width
   c. Bumper Seal Thresholds – 1/2 inch high x 5 inches wide x door width
2. Provide door sweeps, seals, and astragals only of type where resilient or flexible seal strip is easily replaceable and readily available.
3. Acceptable manufacturers and/or products: National Guard, Reese, Zero.

P. Silencers

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

## 2.03 FINISHES

A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:

1. Hinges at Exterior Doors: US32D (BHMA 630).
2. Aluminum Geared Continuous Hinges: US28 (BHMA 628).
3. Push Plates, Pulls, and Push Bars: US32D (BHMA 630).
4. Protection Plates: US32D (BHMA 630).
5. Concealed Overhead Stops: US32D (BHMA 630).
6. Door Closers: Powder Coat to Match.
7. Wall Stops: US32D (BHMA 630).
8. Weatherstipping: Clear Anodized Aluminum.
9. Thresholds: Mill Finish Aluminum.

2.04 KEYING

A. Provide a new key system from the same manufacturer as the locks conforming to the following requirements:

1. Provide restricted patented removable core cylinders at all keyed items. Restricted shall control the access to the products by requiring a signed letter of authorization and/or authorization form from the Owner or authorized agent of the Owner. Patent shall protect against the unauthorized manufacturing and duplication of the products. Restricted patented cores shall not be operable by non-patented key blanks. Restricted patented cores shall incorporate a mechanism to check for the patented features on the keys. Provide construction cores with construction master keying for use during construction. The hardware supplier, accompanied by the Owner or Owner's security agent, shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
2. Provide permanent cores and cylinders keyed by the manufacturer or authorized distributor as directed by the Owner. Provide owner with a copy of the bitting list, return receipt requested.
3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware. Submit a keying schedule to Architect for approval.
4. Provide cores and cylinders, unless noted otherwise, operated by a Grand Master Key System to be established for this project (Do not use the letter "I", "O", or "X" for any of the grand masters). Allow for twenty-four Master Keys under each Grand Master, and sixty-four changes under each master key. All cylinders shall be keyed in alike or different sets as noted by their respective key set number. Do not use the letter "I" or "O" in any of the master key sets.
5. Provide patented restricted keys as follows:
    a. Ten grand master keys for each set.
    b. Ten master keys for each set.
    c. Three keys per core and/or cylinder.
    d. Two construction core control keys
    e. Two permanent core control keys
    f. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)
6. Visual key control:

a. Keys shall be stamped with their respective key set number and stamped “DO NOT DUPLICATE".
b. Grand master and master keys shall be stamped with their respective key set letters.
c. Do not stamp any keys with the factory key change number.
d. Do not stamp any cores with key set on face (front) of Core. Stamp on back or side of cores so not to be visible when core is in cylinder.

7. Deliver grand master keys, master keys, change keys, and/or key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.
8. Approved products: Schlage Everest 29 T, Best Peaks, Sargent Signature.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.02 INSTALLATION

A. Coordination:

1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.
2. Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating finish hardware with security, electrical, doors and frames, and other related suppliers. A representative of the supplier of finish hardware, and doors and frames, the electrical subcontractor, and the Owner’s security contractor shall meet with the Owner, Architect, and General Contractor prior to ordering finish hardware. After meeting a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer’s rep for the item in question, as listed in the hardware schedule.

C. Mount hardware units at heights indicated in “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute.

D. Install each hardware item in compliance with the manufacturer’s instructions and recommendations, using only the fasteners provided by the manufacturer.

E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.

F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

H. Wire (including low voltage), conduit, junction boxes, and pulling of wire is by Division 16, Electrical. Electrical Contractor shall connect wire to door position switches and run wire to central room or area as directed by the Architect. Wires shall be tested and labeled with the Architects opening number. Connections to/from power supplies to electrified hardware and any connection to fire/smoke alarm system, and/or smoke evacuation system where specified is by Division 26, Electrical.

3.03 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware installation.

D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.04 FIELD QUALITY CONTROL

A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:

1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.
5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct the Owner's personnel on the proper maintenance,

adjustment, and/or operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

3.05 PROTECTION

A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.06 HARDWARE SCHEDULE

A. Provide hardware for each door to comply with requirements of Section “Finish Hardware,” hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.

B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.

C. Locksets, exit devices, and other hardware items are referenced in the Hardware Sets for series, type, and function. Refer to the preamble for special features, options, cylinders/keying, and other requirements.

D. See Hardware Schedule on Drawings.

END OF SECTION

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**DECORATIVE GLASS FILM OVERLAY** **SECTION 08 81 13.16**

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 SECTION INCLUDES

A. Decorative glass film overlay.

1.3 DEFINITION

A. Glass Thickness: Indicated by thickness designations in millimeters according to ASTM C1036.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each decorative-glass film product indicated.

C. Product Certificates: For each type of decorative glass, from manufacturer.

D. Maintenance Data: For each type of decorative film overlay include in maintenance manuals.

E. Warranty: Sample of special warranty.

1.5 WARRANTY

A. Warranty: Manufacturer's standard form in which decorative glass film manufacturer agrees to replace film that deteriorates within specified warranty period. Deterioration of film is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning film contrary to manufacturer's written instructions. Defects include fading, delamination and blemishes exceeding those allowed by manufacturer.

1. Warranty Period: One (1) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 DECORATIVE TINTED GLASS FILM

A. Glass Film: Use tinted, dimensionally stable, cast PVC film, 2-mil minimum thickness, with pressure-sensitive, clear adhesive back for adhering to glass and releasable protective backing.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide 3M; Sun Control Window Films or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

      a. Avery Dennison, Graphics.
      b. FDC Graphic Films, Inc.

   2. Color: To be selected by Architect.
   3. Use: Suitable for exterior and interior applications.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Clean glass in compliance with tinted film manufacturers requirements.

### 3.2 INSTALLATION

A. Install tinted film according to manufacturers written directions.

END OF SECTION

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 SECTION INCLUDES

A. Silvered flat glass mirrors of the following types:

1. Tempered monolithic glass mirrors qualifying as safety glazing.

B. Cable suspension system.

1.3 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For qualified installer.

C. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

D. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing paint and (film, if required by manufacturer) and substrates on which mirrors are installed.

E. Warranty: Sample of special warranty.

## 1.5 CLOSEOUT SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Maintenance Data: For mirrors to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

D. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this section or in referenced standards.

E. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing paint and substrates on which mirrors are installed.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five (5) years from date of manufacture.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C1503.

B. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

1. Nominal Thickness: 1/4-inch.

2.2 MISCELLANEOUS MATERIALS

A. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

B. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

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

a. International; Titebond Division.
b. , C. R. Co., Inc.
c. Adhesives; Liquid Nails Division.
d. Corporation.
e. Adhesives & Sealants; Gunther Mirror Mastics Division.

C. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

## 2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.
   1. Product: Subject to compliance with requirements, provide the following:
      a. J Channel: C. R. Laurence Co., Inc.

   2. Finish: Clear anodized

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

## 2.4 CABLE SUSPENSION SYSTEM

A. Suspension system: 3form, Inc; Side Fastening System; Smooth Collection.

B. Components:
   1. Connectors: Single and double panel connectors; Stainless steel.
   2. Cable: 3mm stainless steel.
   3. Jointed cable tensioner.

## 2.5 FABRICATION

A. Mirror Sizes: To suit project conditions, and before tempering, cut mirrors to final sizes and shapes.

B. Mirror Edge Treatment: Rounded polished.

   1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
   2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

C. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

### 3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

### 3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8-inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8-inch thick by 4-inches long at quarter points. To prevent trapping water, provide, between setting blocks, two (2) slotted weeps not less than 1/4-inch wide by 3/8-inch long at bottom channel.
2. Install mastic as follows:

    a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
    b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
    c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8-inch between back of mirrors and mounting surface.

## 3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION

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 SECTION INCLUDES

A. Fixed, extruded-aluminum louvers.

B. Louver screens.

C. Blank-off panels.

1.3 RELATED SECTIONS

A. Division 23 09 00 - HVAC: Coordination with work of this section.

1.4 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this section unless otherwise defined in this section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.5 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic 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. Wind pressures shall be considered to act normal to the face of the building.

1. Calculations: Structural calculations shall be performed by an engineer licensed in the state where the project is located, based on the criteria indicated on the structural drawings and current state and local building codes.

C. Seismic Performance: Provide louvers capable of withstanding the effects of earthquake motions determined according to current building codes for the state where project is located.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): 120 degrees F, ambient; 180 degrees F, material surfaces.

E. 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.

## 1.6 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

C. 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.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

D. Samples for Verification: For each type of metal finish required.

E. Delegated-Design Submittal: For louvers indicated to comply with structural and seismic performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.7 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and

witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

## 1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.2, "Structural Welding Code - Aluminum."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.

   1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
   2. For fastening aluminum, use aluminum or 300 series stainless steel fasteners.
   3. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

## 2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
   1. Horizontal Mullions: Provide horizontal mullions at joints unless continuous vertical assemblies are indicated.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. 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.

1. Frame Type: Channel or Exterior flange type unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.
1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with mullions at corners.

G. Provide subsills made of same material as louvers or extended sills for recessed louvers.

H. Join frame members to each other and to fixed louver blades with filletwelds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## 2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Continuous-Line, Drainable-Blade Louver: Drainable-blade louver with blade gutters (drains) in rear two-thirds of blades only and with semi-recessed mullions capable of collecting and draining water from blades.

1. -of-Design Product: Subject to compliance with requirements, provide the product specified or a product of another manufacturer of equal or better quality and performance as approved by the Architect:

a. Basis of Design Product: Company, LLC (The). Model #K609HP.
b. Specialties, Inc. Model #A4097.
c. Company; Tomkins PLC. Model #ELF445DX.

2. Louver Depth: Four (4) inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080-inch.
4. Louver Performance Ratings:

a. Free Area: Not less than 8.23 sq ft for 48-inch wide by 48-inch high louver.
b. Point of Beginning Water Penetration: Not less than 850 fpm velocity.
c. Air Performance: Not more than 0.15-inch wg static pressure drop at 886-fpm free-area velocity.

## 2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Insect screening.

B. Secure screen frames to louver frames with machine screws with heads finished to match louver.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.
   2. Finish: Same finish as louver frames to which louver screens are attached.
   3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:
   1. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch wire.

## 2.5 BLANK-OFF PANELS

A. Insulated, Blank-Off Panels: Laminated panels consisting of insulating core surfaced on back and front with metal sheets and attached to back of louver.

   1. Thickness: One (1) inch.
   2. Metal Facing Sheets: Aluminum sheet, not less than 0.032-inch nominal thickness.
   3. Insulating Core: Rigid, glass-fiber-board insulation or extruded-polystyrene foam.
   4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness, with corners mitered and with same finish as panels.
   5. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
   6. Panel Finish: Same finish applied to louvers.
   7. Attach blank-off panels with sheet metal screws.

## 2.6 FINISHES, GENERAL

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

## 2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018-mm or thicker.
   1. Color: To be selected by Architect.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and openings, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

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

### 3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

### 3.3 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 weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted 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 or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 for sealants applied during louver installation.

## 3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
   1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

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**GYPSUM BOARD SHAFT WALL ASSEMBLIES** **SECTION 09 21 16.23**

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 SECTION INCLUDES

A. Gypsum board shaft wall assemblies.

1.3 RELATED SECTIONS

A. Section 09 29 00 – Gypsum Board: Coordinate with work of this section.

1.4 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each component of gypsum board shaft wall assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Evaluation Reports: For shaft wall assemblies, firestop tracks, from ICC-ES.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install 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.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E90 and classified according to ASTM E413 by a testing and inspecting agency.

### 2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated on wall assemblies. Refer to 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: As indicated on drawings.
2. Minimum Base-Metal Thickness: 22 gage.

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least two (2) inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: 24 gage.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Room-Side Finish: Gypsum board unless noted otherwise on drawings.

G. Shaft-Side Finish: Gypsum shaftliner board, moisture- and mold-resistant Type X.

H. Insulation: Sound attenuation blankets.

## 2.3 PANEL PRODUCTS

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

B. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C1396; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

1. : Subject to compliance with requirements, provide one (1) of the following:
   a. -Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
   b. North America, Inc.; Firecheck Moldcheck Type X Shaftliner.
   c. Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
   d. Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.

2. Thickness: One (1) inch.
3. Long Edges: Double bevel.
4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

C. Gypsum Board: As specified in Section 09 29 00.

## 2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C645 requirements for metal unless otherwise indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653, G40 unless otherwise indicated.

B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the 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.

1. : Subject to compliance with requirements, provide one (1) of the following:

   a. Trak Corp.; Fire Trak System
   b. -Lite, Inc.; The System.
   c. Network Inc. (The); VertiClip SLD Series.

## 2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 09 29 00 that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

D. 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.

E. Sound Attenuation Blankets: As specified in Section 07 21 00.

F. Acoustical Sealant: As specified in Section 07 92 00.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

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

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

### 3.2 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 Section 07 81 00.

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.

### 3.3 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 ASTM C754 other than stud-spacing requirements.

B. Do not bridge 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, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

D. Penetrations: 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, elevator call buttons, elevator floor indicators, 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 at locations indicated on Drawings while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: 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.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8-inch from the plane formed by faces of adjacent framing.

## 3.4 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

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# 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 SECTION INCLUDES

A. Non-load-bearing steel framing members for the following applications:

1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
2. Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

## 1.3 RELATED SECTIONS

A. Section 07 21 00 - Thermal Insulation: Insulation installed within framing members.

B. Section 07 84 46 - Fire-Resistive Joint Systems: Head-of-wall joint systems installed with non-load-bearing steel framing.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

## 1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 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 E90 and classified according to ASTM E413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for metal, unless otherwise indicated.
2. Protective Coating: ASTM A653, G60, hot-dip galvanized, unless otherwise indicated.
3. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch diameter wire.

B. Hanger Attachments to Concrete:

1. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.

C. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538-inch and minimum 1/2-inch wide flanges.

1. Depth: 1-1/2 inches unless indicated otherwise.

E. Furring Channels (Furring Members):

1. Steel Studs: ASTM C645.

a. Minimum Base-Metal Thickness: 0.0179-inch.
b. Depth: 1-5/8 inches.

2. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8-inch deep.

a. Minimum Base Metal Thickness: 0.0179-inch.

## 2.3 METAL SUSPENSION SYSTEM FOR GYPSUM BOARD CEILING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Drywall Grid System HD or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. Chicago Metallic Corporation; Fire Front 670-C Drywall Furring System.
2. USG Corporation; Drywall Suspension System Type DGLW.

B. Wide-Face, Capped, Double-Web, Steel Suspension System: Grid Suspension System for Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock. Main and cross runners roll formed from cold-rolled steel sheet; electrolytically zinc coated, or hot-dip galvanized according to ASTM A653, not less than G30 coating designation; with prefinished 1-1/2-inch wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush 1-1/2-inch wide.
4. Cap Material: Steel cold-rolled sheet.
5. Coordinate finish in "Cap Finish" subparagraph below with metal type selected.
6. Cap Finish: Un-painted steel
7. Ceiling Type: Gypsum board ceiling.

## 2.4 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C645.
1. Minimum Base-Metal Thickness: 0.0312-inch.
2. Depth: As indicated on Drawings.

B. Slip-Type Head Joints: Where indicated, provide one (1) of the following:

1. Double-Runner System: ASTM C645 top runners, inside runner with 2-inch deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, provide one (1) of the following:

1) Steel Network Inc. (The); VertiTrack VTD Series.
2) Superior Metal Trim; Superior Flex Track System (SFT).

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the 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.

1. Products: Subject to compliance with requirements, provide one (1) of the following:

   a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
   b. Metal-Lite, Inc.; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0312-inch.

E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base Metal Thickness: 0.0312-inch.
2. Depth: 7/8-inch.

G. Cold-Rolled Furring Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch wide flanges.

1. Depth: 3/4-inch.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312-inch.
3. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch diameter wire.

## 2.5 AUXILIARY MATERIALS

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

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

B. Isolation Strip at Exterior Walls: Provide one (1) of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226, Type I (No. 15 asphalt felt), non-perforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

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

### 3.2 PREPARATION

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

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

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (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 o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

### 3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

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

C. Install bracing at terminations in assemblies.

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

## 3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

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

C. Suspend hangers from building structure as follows:

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

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

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

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

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

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

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

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

## 3.5 INSTALLING FRAMED ASSEMBLIES

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

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

1. Space studs as follows:

a. Single-Layer Application: 16 inches o.c., unless otherwise indicated.
b. Multilayer Application: 16 inches o.c., unless otherwise indicated.
c. Tile backing panels: 16 inches o.c., unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

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

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

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

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8-inch from the plane formed by faces of adjacent framing.

END OF SECTION

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# 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 SECTION INCLUDES

A. Interior gypsum board.

## 1.3 RELATED SECTIONS

A. Section 05 40 00 - Cold-Formed Metal Framing: Load-bearing steel framing that supports gypsum board.

B. Section 06 10 00 - Rough Carpentry: Wood framing and furring that supports gypsum board.

C. Section 07 92 00 – Joint Sealants: Acoustical Joint Sealants.

D. Section 09 22 16 - Non-Structural Metal Framing: Non-structural framing and suspension systems that support gypsum board.

E. Section 09 91 00 – Paints and Coatings: For primers applied to gypsum board surfaces.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.

## 1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

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

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C36 or ASTM C1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. 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:

a. American Gypsum Co.
b. G-P Gypsum.
c. Lafarge North America Inc.
d. National Gypsum Company.
e. USG Corporation.

B. Gypsum Board, Type X: ASTM C1396.

1. Thickness: 5/8-inch.
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C1396; Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2-inch.
2. Long Edges: Tapered.

D. Moisture-and Mold-Resistant Gypsum Board: ASTM C1396. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8-inch, Type X.
2. Long Edges: Tapered.

## 2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

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

B. Sound Isolation Clips: Resilient soundproofing clips for walls and ceilings compatible with standard drywall furring channels.
1. Manufacturer's
a. Sound Isolation Co.: ResilMount Series
b. Acoustical Solutions, Inc.: Resilient Isolation Clips
c. Acoustical Surfaces, Inc.: Noise S.T.O.P. Resilient Isolation Clips
2. Resilient Thermoplastic rubber diaphragm mounted on galvanized metal clip.

## 2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints**,** rounded or beveled panel edges, and damaged surface areas, use drying-type, all-purpose taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose compound.

4. Finish Coat: For third coat, use drying-type, all-purpose compound.

## 2.5 AUXILIARY MATERIALS

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

B. Steel Drill Screws: ASTM C1002, unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112-inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Acoustical Sealant: As specified in Section 07 92 00.

D. Thermal Insulation: As specified in Section 07 21 00.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine areas and substrates, with installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

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

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

## 3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one (1) framing member.

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

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on

opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

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

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

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

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

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

## 3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Type X: General Where required for fire-resistance-rated assembly.
2. Ceiling Type: Ceiling surfaces.
3. Moisture- and Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

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

    a. Stagger abutting end joints not less than one (1) framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one (1) framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one (1) stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one (1) furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws

## 3.4 INSTALLING TRIM ACCESSORIES

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

B. Control Joints: Install control joints at locations indicated on Drawings and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. Bullnose Bead: Use where indicated.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use where indicated.
6. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

## 3.5 FINISHING GYPSUM BOARD

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

B. Prefill open joints**,** rounded or beveled edges**,** and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840: All exposed panels shall be finished to a Level 4 finish unless noted otherwise.

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.

## 3.6 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, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

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# 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 SECTION INCLUDES

A. Ceramic tile.

B. Waterproof membrane.

C. Stone thresholds.

D. Metal edge strips.

## 1.3 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants: Sealing of expansion, contraction, control, and isolation joints in tile surfaces.

## 1.4 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

## 1.5 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Stone thresholds in 6-inch lengths.

## 1.6 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For qualified installer.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and -grouting product.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Furnish extra materials that match and are from same production runs as 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 three (3) percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to three (3) percent of amount installed for each type, composition, and color indicated.

## 1.8 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one (1) source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one (1) manufacturer and each aggregate from one (1) source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this section from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproof membrane.
3. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

## 1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

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

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

## 1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.11 WARRANTY

A. Submit a written warranty executed by the manufacturer stating products will be free from defect for a period of one-year from date of purchase. Defect is defined as a shortfall in the product to perform to manufacturers specifications as disclosed in product literature, within industry allowable tolerances as set forth in standard, national industry protocols.

B. Limited Warranty Period:

1. One (1) year from date of purchase.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

D. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type PT-1: Floor Tile.

1. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer.

a. DgC, LePietre.

2. Composition: Porcelain.
3. Face Size: As selected by Architect.
4. Tile Color and Pattern: As scheduled on drawings
5. Grout Color: As selected by Architect.

B. Tile Type PTB-1: Base Tile.

1. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer.

   a. DgC, LePietre.

2. Composition: Porcelain.
3. Face Size: As selected by Architect.
4. Tile Color and Pattern: As scheduled on drawings
5. Grout Color: As selected by Architect.

C. Tile Type CWT-1: Wall Tile.

1. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer.

   a. American Olean.

2. Composition: Ceramic.
3. Face Size: 4-1/4 by 8-1/2 inch.
4. Tile Color and Pattern: As scheduled on drawings
5. Grout Color: As selected by Architect.

D. Tile Type CWT-2: Wall Tile.

1. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer.

   a. American Olean.

2. Composition: Glass.
3. Face Size: 5/8 by 5/8 inch (Mosaic)
4. Tile Color and Pattern: As scheduled on drawings
5. Grout Color: As selected by Architect.

E. Tile Type CWT-3: Wall Tile.

1. Manufacturers: Subject to compliance with requirements, provide products by the following manufacturer.

   a. Crossville.

2. Composition: Porcelain.
3. Face Size: 1/2 by 3 inch (Mosaic)

4. Tile Color and Pattern: As scheduled on drawings
5. Grout Color: As selected by Architect.

## 2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16-inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2-inch or less above adjacent floor surface.

B. Marble Thresholds: ASTM C503, with a minimum abrasion resistance of 10 per ASTM C1353 or ASTM C241 and with honed finish.
1. Description: To be selected by Architect.

## 2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.

1. : Subject to compliance with requirements, provide one (1) of the following:
   a. American; an Oldcastle company (ProSpec); B-6000 Waterproof Membrane with Glass Fabric.
   b. , Inc.; Hydroment Blacktop 90210.
   c. International, Inc.; Laticrete 9235 Waterproof Membrane.
   d. Corporation; Mapelastic AquaDefense.

## 2.5 SETTING MATERIALS

A. Latex-Gray Portland Cement Mortar (Thin Set) for Ceramic, Porcelain and Stone Tile: ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. American; an Oldcastle company (ProSpec): PermaFlex 500.
   b. , Inc.: Hydroment Reflex Ultra-Premium.
   c. International, Inc.: Laticrete 254 Platinum.
   d. Corporation: Ultraflex 2

2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at project site.

3. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

## 2.6 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
   a. American; an Oldcastle company: (ProSpec) Sanded Tile grout 700
   b. , Inc: Hydroment Ceramic Tile Grout.
   c. International, Inc: Latacrete PermaColor Grout.
   d. Corporation: Keracolor S.

## 2.7 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07 92 00.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

## 2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

A. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications stainless steel, ASTM A666, 300 Series exposed-edge material.

1. -of-Design Product: Subject to compliance with requirements, provide the product specified or a product of another manufacturer of equal or better quality and performance as approved by the Architect:
   a. Basis of Design: Schluter Systems;
      1) Type: Carpet to Tile
         a) Style: Schiene AE 45 ,
         b) Finish: Satin Anodized Aluminum.
      2) Type: Tile to Tile
         a) Style: Deco AE 100 D ,
         b) Finish: Satin Anodized Aluminum.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

## 2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

## 3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4-inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one (1) package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.

## 3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.

B. 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.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Ceramic Mosaic Tile: 1/16-inch.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
   1. Do not extend waterproofing under thresholds set in latex-portland cement mortar. Fill joints between such thresholds and adjoining waterproofing with elastomeric sealant.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

## 3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

## 3.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

## 3.6 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113.

    a. Tile Type: As scheduled on drawings.
    b. Thin-Set Mortar: Latex- Portland cement mortar.
    c. Grout: Polymer-modified sanded grout.

2. Tile Installation F122: Thin-set mortar on waterproof membrane; TCA F122.

    a. Tile Type: As scheduled on drawings.
    b. Thin-Set Mortar: Latex- Portland cement mortar.
    c. Grout: Polymer-modified sanded grout.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation W243: Thin-set mortar on gypsum board; TCA W243.

    a. Tile Type: As scheduled on drawings.
    b. Thin-Set Mortar: Latex- Portland cement mortar.
    c. Grout: Polymer-modified sanded grout.

END OF SECTION

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# 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 SECTION INCLUDES

A. Acoustical ceiling panels.

B. Suspension systems for ceilings.

## 1.3 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants: Acoustical Joint Sealants.

B. Products furnished, but not installed under this section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

## 1.4 DEFINITIONS

A. AC: Articulation Class.

B. CAC: Ceiling Attenuation Class.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Coordination Drawings: Scaled Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members.
2. Method of attaching hangers to building structure.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

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

1. Acoustical Panel: Set of 6-inch square samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch long samples of each type, finish, and color.

E. Qualification Data: For testing agency.

F. Field quality-control test reports.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

H. Research/Evaluation Reports: For each acoustical panel ceiling and components.

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

## 1.6 QUALITY ASSURANCE

A. Source Limitations:

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one (1) source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E1264 for Class A materials as determined by testing identical products per ASTM E84:

D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:

1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E580.

E. 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.

F. Preinstallation Conference: Conduct conference at project site to comply with requirements in Section 01 31 00.

## 1.7 DELIVERY, STORAGE AND HANDLING

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

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

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

## 1.9 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## 1.10 EXTRA MATERIALS

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

1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

# PART 2 - PRODUCTS

## 2.1 ACOUSTICAL PANELS, GENERAL

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E795.

B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

C. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D3273 and evaluated according to ASTM D3274 or ASTM G21.

D. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D3273 and evaluated according to ASTM D3274 or ASTM G21.

## 2.2 MANUFACTURER

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

1. Armstrong World Industries, Inc.
2. CertainTeed Ceilings, Inc.
3. Chicago Metallic Corporation.
4. USG Interiors, Inc.

B. Substitutions will be considered only if submitted in full compliance with Sections 01 25 00 and 01 16 00.

## 2.3 ACOUSTICAL PANELS – ACT-1

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Optima: Item # 3251** or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide Class A rated panels complying with ASTM E1264 for type, form, and pattern.

1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth.
2. Pattern: E (lightly textured).

C. Color: White.

D. LR: Not less than 0.90.

E. NRC: Not less than 0.95.

F. CAC: N/A.

G. AC: Not less than 190.

H. Edge/Joint Detail: Square Tegular.

I. Thickness: 1-inch.

J. Suspension Grid Face: 9/16-inch.

K. Modular Size: 24 by 24 inches.

L. Anti Mold/Mildew & Bacteria: Fiberglass substrate is inherently resistant to growth of mold mildew and bacteria.

M. Dimensional Stability: Resistance to sagging in high humidity conditions up to, but not including standing water and outdoor conditions.

2.4 ACOUSTICAL PANELS – ACT-2

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Optima Open Plan: Item #3256PB** or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Classification: Provide Class A rated panels complying with ASTM E1264 for type, form, and pattern.

1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 2, cloth.
2. Pattern: E (lightly textured).

C. Color: White.

D. LR: Not less than 0.90.

E. NRC: Not less than 0.95.

F. AC: Not less than 190.

G. Edge/Joint Detail: Square Tegular.

H. Thickness: 1-inch.

I. Suspension Grid Face: 9/16-inch.

J. Modular Size: 48 by 48 inches.

K. Anti Mold/Mildew & Bacteria: Fiberglass substrate is inherently resistant to growth of mold mildew and bacteria.

L. Dimensional Stability: Resistance to sagging in high humidity conditions up to, but not including standing water and outdoor conditions.

## 2.5 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three (3) times hanger design load (ASTM C635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 12 gauge or 0.106-inch diameter wire.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

F. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

G. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all cross tees.

H. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

## 2.6 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Suprafine #7501** or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A653, not less than G30 coating designation; with prefinished 9/16-inch wide metal caps on flanges.

1. Structural Classification: Heavy-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Aluminum.
5. Cap Finish: Painted white.
6. Acoustical Ceiling Panel: ACT-1, ACT-2.

## 2.7 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Axiom Classic Perimeter Trim Straight #AX Series or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B221 for Alloy and Temper 6063-T5.

2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## 2.8 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Axiom Classic Knife Edge #AXKE Series or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B221 for Alloy and Temper 6063-T5.
2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635 and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

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

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

## 3.2 PREPARATION

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

## 3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

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

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than eight (8) inches from ends of each member.
10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.

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

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than three (3) inches from ends, leveling with ceiling suspension system to a tolerance of 1/8-inch in 12 feet. Miter corners accurately and connect securely.

3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one (1) another. Remove and replace dented, bent, or kinked members.

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

1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.
5. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
6. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

## 3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

# 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 SECTION INCLUDES

A. Wood veneer ceiling panels.

B. Exposed grid suspension system.

C. Wire hangers, fasteners, main runners, cross tees, wall angle moldings and accessories.

## 1.3 RELATED SECTIONS

A. Section 09 51 13 - Acoustical Panel Ceilings.

B. Division 23 sections for HVAC work associated with or above wood panel ceilings.

C. Division 26 sections for electrical work associated with or above wood panel ceilings.

## 1.4 REFERENCES

A. ASTM International (ASTM):

1. ASTM A641 - Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
2. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
3. ASTM A1008 - Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
4. ASTM C423 - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM C635 - Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
7. ASTM E580 - Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.
8. ASTM E1414 - Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

B. International Code Council Evaluation Service:

1. AC156 - Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Submit manufacturer's technical data for each type of ceiling unit and suspension system required.

C. Shop Drawings: Show location of wood panel ceiling, large-scale details, attachment devices, and other components. Include dimensioned reflected ceiling plans.

D. Samples:

1. Wood Panels: Submit minimum 8-3/8 inch x 11-1/2 inch samples of specified panel
2. Exposed Wall Molding: Submit eight (8) inch long samples.
3. Suspension System: Submit eight (8) inch long samples.

E. Manufacturer's installation instructions.

F. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

## 1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide ceiling panel units and grid components by a single manufacturer.

1. Surface Burning Characteristics: Composite product tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.

a. Flame Spread: 25 or less
b. Smoke Developed: 50 or less

B. Woodworking Standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.

C. Seismic Performance: System seismic performance verified through full-scale testing in accordance with ICC-ES – AC-156 Acceptance Criteria for Seismic Qualification Testing of Non-Structural Components.

D. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Store ceiling components in a dry interior location in their cartons prior to installation to avoid damage. Store cartons in a flat, horizontal position. Do not remove protection between panels until installation is to begin.

B. Do not store in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees F or greater than 86 degrees F. Do not expose panels to extreme temperatures, for example, close to a heating source or near a window with direct sunlight.

C. Handle ceiling units carefully to avoid chipped edges or damage to units in any way.

## 1.8 PROJECT CONDITIONS

A. Permit wood veneer ceiling materials to reach room temperature and permit moisture content to stabilize for a minimum of 72 hours before installation. Remove plastic wrap to allow panels to acclimate.

B. Do not install wood veneer panels in spaces where the temperature or humidity conditions vary greatly from the temperatures and conditions that will be normal in the occupied space.

C. As interior finish products, the wood veneer panels are designed for installation in temperature conditions between 50 degrees F and 86 degrees F, in spaces where the building is enclosed and HVAC systems are functioning and will be in continuous operation. Relative humidity should not fall below 25 percent or exceed 55 percent.

## 1.9 WARRANTY

A. Wood Panels: 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:

1. Defects in materials or factory workmanship.

B. Warranty Period:

1. Wood Veneer Panel: One (1) year from date of installation.

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.

1.10 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Package with protective covering for storage and identify with appropriate labels.

1. Ceiling Units: Furnish quality of full-size units equal to 2.0 percent of amount installed.
2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 1.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 WOOD VENEER CEILING UNITS – WD-1

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Armstrong World Industries, Inc.; Woodworks Linear** or a product of another manufacturer of equal or better quality and performance as approved by the Architect: by one (1) of the following:

1. 9 Wood Inc.: Style: 2300 Continuous Linear.
2. SelecTrim Corp: NaturaLines Linear Wood Ceiling; Style: SWL 634.

B. Wood Panels: WoodWorks Linear Unperforated Wood Veneer Ceiling Panels #6460W1BAP.
1. Plenum Access: Full downward access.
2. Surface Texture: Smooth
3. Substrate: Duraflake FR, Class A rated fire-retardant particleboard.
4. Size: Nominal 6-inch wide planks by 96-inch long by ¾-inch thickness.
5. Surface Finish:

a. Grade: Manufacture's standard.
b. Veneer Species: Bamboo-Patina (BAP)
c. Cut: Manufacturer's standard.
d. Veneer Match: Manufacturer's standard.

6. Flame Spread: Class A per IBC
7. Edge Detail: Square cut edge for installation on WoodWorks Flat Hook-on suspension system.
8. Reveal: 3/4-inch
9. Joint Gaskets: Six (6) mm gasket.

C. Accessories:

1. Acoustical Infill: BioAcoustic Infill Panel, #5823 (Black).
2. Cutouts and Apertures: Intended for use with audio speakers, air diffusers, flexible head sprinklers and certain light fixtures. They are not intended for use with smoke detectors.
3. Edge Banding for Field-modified Panels: Pre-finished pressure sensitive adhesive banding is available 15/16-inch wide and in 50 foot lengths.
4. Perimeter Trim #5659W1BAP - 4" Woodworks Concealed Veneer Wrapped Aluminum Trim – 6" x 10'.

## 2.2 SUSPENSION SYSTEM

A. Product: Armstrong WoodWorks Linear Suspension System.

B. Components: All main beams and cross tees shall be commercial quality hot dipped galvanized steel (galvanized steel, aluminum, or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with 15/16 in type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).

1. Structural Classification: ASTM C 635 Heavy Duty.
2. Color: TechBlack.
3. Acceptable Product: Prelude XL 15/16" Exposed Tees manufactured by Armstrong World Industries, Inc.

C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least time three design load, but not less than 12 gauge.

E. Accessories

1. T-Bar Hook, Item #5986.
2. Wood Screws, #91070A244.
3. Safety Cable, #6091.
4. Support Hanger, #SH12.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out.

B. Proper design for both supply air and return air, maintenance of the HVAC filters and building interior space are essential to minimize soiling. Before starting the HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

### 3.2 PREPARATION

A. Examine construction and conditions under which the system will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected. Coordinate panel layout with mechanical and electrical fixtures.

### 3.3 INSTALLATION

A. Install suspension system and panels in compliance with ASTM C636, with the authorities having jurisdiction, and in accordance with the manufacturer's shop drawings and installation instructions.

### 3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

**RESILIENT BASE AND ACCESSORIES** **SECTION 09 65 13**

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 SECTION INCLUDES

A. Resilient base.

1.3 RELATED SECTIONS

A. Section 09 68 16 – Sheet Carpeting: Roll carpet floor coverings.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

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

D. Product Schedule: For resilient products. Use same designations indicated on the Schedule for Finishes and the Drawings.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq cm.

B. Mockups: Provide resilient products with mockups specified in other sections.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degree  more than 95 degree F, in spaces to receive resilient products during the following time periods:

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

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 degree F or more than 95 degree F.

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

1.8 EXTRA MATERIALS

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

1. Furnish not less than 2 linear feet for every, of each type, color, pattern, and size of resilient product installed.

1.9 WARRANTY

A. Submit a written warranty executed by the manufacturer, agreeing to repair or replace materials that fail within the warranty period.

B. Limited Warranty Period:

1. One (1) year from date of installation.

PART 2 - PRODUCTS

2.1 RESILIENT BASE – RB-1

A. Resilient Base: -of-Design Product:  Subject to compliance with requirements, provide the product specified or a product of another manufacturer of equal or better quality and performance as approved by the Architect:

1. Basis of Design Product:  Corporation, USA:  700 Series.
2. Johnsonite; Traditional Wall Base.
3. Mannington Commercial:  Premium Edge.

B. Resilient Base Standard:  ASTM F1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125-inch.

D. Height: Four (4) inches.

E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Preformed.

H. Finish: Satin.

I. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 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 resilient products and substrate conditions indicated.
   a. Rubber Floor Adhesives: Not more than 60 g/L.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for conditions affecting performance of the Work.

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

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

## 3.2 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 F710.

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. Proceed with installation only after substrates pass testing.

    a. Perform anhydrous calcium chloride test, ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of three (3) lb of water/1000 sq ft in 24 hours or as recommended by manufacturer of flooring products.
    b. Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.

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.

## 3.3 RESILIENT BASE INSTALLATION

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

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

C. Install resilient base in lengths as long as 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.

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

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

## 3.4 CLEANING AND PROTECTION

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

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

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

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

D. Cover resilient products until Substantial Completion.

END OF SECTION

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**SHEET CARPETING SECTION 09 68 16**

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 SECTION INCLUDES

A. Woven carpet.

1.3 RELATED SECTIONS

A. Section 09 65 13 - Resilient Base and Accessories: Resilient wall base and accessories installed with carpet.

1.4 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For the following, including installation recommendations for each type of substrate:
   1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Carpet Cushion: For each type indicated. Include manufacturer's written data on physical characteristics and durability.

C. 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. Type of subfloor.
   5. Type of installation.
   6. Pattern type, repeat size, location, direction, and starting point.
   7. Type, color, and location of insets and borders.
   8. Type, color, and location of edge, transition, and other accessory strips.
   9. Transition details to other flooring materials.
   10. Type of carpet cushion.

D. Samples: For each of the following products and for each color and texture required. Label each sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch square sample.

2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch long samples.
3. Carpet Cushion: 6-inch square sample.
4. Carpet Seam: 6-inch sample.
5. Mitered Carpet Border Seam: 12-inch square sample. Show carpet pattern alignment.

E. Product Schedule: For carpet, use same designations indicated on Drawings.

## 1.5 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For qualified installer.

C. Product Test Reports: For carpet and carpet cushion, for tests performed by a qualified testing agency.

D. Sample Warranties: For special warranties.

## 1.6 CLOSEOUT SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

## 1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Preinstallation Conference: Conduct conference at project site to comply with requirements in Section 01 31 00.

## 1.8 DELIVERY, STORAGE AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.9 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

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

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

1.10 WARRANTY

A. Special Warranty for Carpet: Manufacturer's standard form in which 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 WOVEN CARPET – C-1

A. Products: Subject to compliance with requirements, provide the following:

   1. Tandus Flooring, Inc.

B. Color: Midnight Hour

C. Pattern: Bella 60124.

D. Fiber Content: SD Nylon.

E. Pile Characteristic: Woven-loop pile.

F. Pitch: 135.

G. Backing: Woven Polyptopylene.

H. Applied Soil-Resistance Treatment: Manufacturer's standard material.

I. Antimicrobial Treatment: Manufacturer's standard material.

2.2 WOVEN CARPET – C-2

A. Products: Subject to compliance with requirements, provide the following:

1. Masland Contract, Inc.

B. Color: Monsoon Wind.

C. Pattern: Silkroad #7462.

D. Fiber Content: Legacy nylon.

E. Pile Characteristic: Tip Sheared enhanced loop pile.

F. Pile Thickness: .313” / .188”

G. Gauge: 1/10.

H. Face Weight: 36 oz/sq yd.

I. Total Weight: 82 oz/sq yd for finished carpet.

J. Backing: Woven Polypropylene.

K. Applied Soil-Resistance Treatment: Manufacturer's standard material.

L. Antimicrobial Treatment: Manufacturer's standard material.

M. Performance Characteristics: As follows:
1. Critical Radiant Flux Classification: Not less than 0.45 W/sq cm.
2. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC 165.
3. Electrostatic Propensity: Less than 3.0 kV per AATCC 134.

2.3 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, non-staining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

C. 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 EXAMINATION

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

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
   2. Subfloor finishes comply with requirements specified in Section 03 30 00 for slabs receiving carpet.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

### 3.2 PREPARATION

A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.

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

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

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

### 3.3 INSTALLATION

A. 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."

B. 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.
   1. Bevel adjoining border edges at seams with hand shears.

C. Do not bridge building expansion joints with carpet.

D. 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.

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

F. 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, non-staining marking device.

G. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

## 3.4 CLEANING AND PROTECTING

A. 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.

B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."

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

END OF SECTION

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 SECTION INCLUDES

A. Aluminum wall panels.

B. Accessories; provide other necessary items including devices for attachment, secondary members, splines, splices, connecting clips, wall connectors, trims, and other devices required for a complete installation.

C. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support metal wall suspension system.

D. Coordinate layout and installation of items penetrating or being installed into wall systems with responsible trades.

1.3 RELATED SECTIONS

A. Section 05 40 00 - Cold-Formed Metal Framing.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Shop Drawings:

1. Include plans, elevations, sections, and mounting-attachment details.
2. Show metal wall suspension system plan with appropriate components, suggested support locations & details.
3. Indicate method of attaching suspension system to building structure.
4. Illustrate wall coordination with: light fixtures, air outlets and inlets, speakers, railings, and other interfaces.
5. Special moldings at ceilings, rail attachments, and other junctures with adjoining construction.

D. Samples for Verification: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Coordination Drawings: Elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Wall mounted items.
   2. Joint patterns and details.
   3. Method of attaching.

F. Sample Warranty: For manufacturer's warranty.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum of five (5) years experience manufacturing similar products to those specified.

B. Installer Qualifications: Minimum of five (5) years experience installing similar systems and scope to those specified.

C. Source Limitations: Obtain metal wall panel components from one (1) source with resources to provide products of consistent quality in appearance, physical properties, and performance.

D. Delegated Design: Calculations supporting structural performance of the wall panels shall be prepared by a professional structural engineer.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Build mockup of typical materials indicated for completed work as shown on Drawings.
   2. Locate mockups in location and of size indicated or, if not indicated, as directed by Architect. Minimum mockup size to be 10 by 10 ft unless otherwise specified.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at project site.

## 1.6 DELIVERY, STORAGE AND HANDLING

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

B. Handle metal wall panels, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

C. Do not remove protective layer from panels until after installation is complete to prevent panel surface damage.

## 1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install metal wall system until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

## 1.8 COORDINATION

A. Coordinate layout and installation of metal wall panels and suspension system with other construction that penetrates walls or is supported by them, including light fixtures and partition assemblies.

## 1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace material that fail(s) in materials or workmanship within specified warranty period.

1. Warranty Period: One (1) years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 STABILIZED ALUMINUM FOAM PANELS – SF-1

A. Products: Subject to compliance with requirements, provide the following:

1. Cymat Technologies Ltd, Alusion Open Both Sides – Large Cell Panel.

B. Material: Cellular cast aluminum foam. 100 percent recyclable and produced using post-industrial aluminum, which is composed of up to 20 percent post-consumer aluminum.

C. Manufacturing Process: Stabilized Aluminum Foam (SAF) - The term for foam produced by introducing gas bubbles into a melt of metal matrix composite (MMC). The hard ceramic particles in the aluminum alloy stabilize the bubbles allowing the foam to be formed into its final shape.

1. Thicknesses: 1 inch (25.4 mm).

D. Material Characteristics (Skins both sides):
1. Standard Size: 4 feet by 8 feet (1219 mm by 2438 mm).
2. Fire Rating (ASTM E 84): Class A with Flame Spread = 0 and Smoke Developed = 20.

3. Fungus Formation (ASTM G 21): 0 Rating, no growth after 28 days.
4. Density (+/-0.055 g/cc):

    a. 1.0 Large: 0.17.

E. Mechanical Properties (0.5 small cell):

    a. Tensile Strength (ASTM B 557): 190 psi (1310 KPa).
    b. Compression at Yield (Modified Procedure Based on ASTM E 9): 2000 lbf (0.9 MPa).
    c. Transverse Load (ASTM E 72, Section 11): 10.7 psf (513 Pa).

## 2.2 METAL SUSPENSION SYSTEMS

A. Metal Suspension Systems Standard: Provide panel manufacturer's standard metal suspension systems of types and finishes indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and structural framing and to which metal wall panels attach or abut, with installer present, for compliance with requirements specified in this and other sections that affect metal wall panel system installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of metal wall panel system.

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

## 3.2 PREPARATION

A. Furnish layouts of cast-in-place anchors, clips, and other anchors whose installation is specified in other sections.

B. Measure wall areas to receive modular metal wall panels and establish layout of units to balance border widths at opposite ends of each wall. Avoid using less than half width units at borders, and comply with layout shown on elevations.

C. Examine substrate for wall attachment to ensure squareness and proper elevation for wall panel installation. Correct any imperfections found.

## 3.3 INSTALLATION

A. Install metal wall panel system in accordance with approved shop drawings and manufacturer's written instructions.

B. Install edge moldings and trim of type indicated at perimeter of modular metal wall panel areas and where necessary to conceal edges of panels. Method of edge trim attachment and design of edge trims to be as approved by Architect.

END OF SECTION

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# 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 SECTION INCLUDES

A. Surface preparation and the application of paint systems on the following interior, and exterior substrates:

1. Concrete masonry units (CMU).
2. Steel.
3. Galvanized metal.
4. Aluminum (not anodized or otherwise coated).
5. Wood.
6. Gypsum board.

## 1.3 RELATED SECTIONS

A. Division 05 sections for shop priming of metal substrates with primers specified in this section.

B. Division 06 sections for shop priming carpentry with primers specified in this section.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Samples for Initial Selection: For each type of topcoat product indicated.

D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit samples on rigid backing, eight (8) inches square.
2. Step coats on samples to show each coat required for system.
3. Label each coat of each sample.
4. Label each sample for location and application area.

E. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

## 1.5 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 (1) surface to represent surfaces and conditions for application of each paint system specified in Part 3.

    a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq ft.
    b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. 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.

## 1.6 DELIVERY, STORAGE AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degree F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

## 1.7 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than five (5) degrees F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. PPG Architectural Finishes, Inc.
4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Regulatory Compliance: All Paints and Coatings shall comply with VOC regulations of the State of New York.

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one (1) 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.

C. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Non-flat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.
7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
8. Non-flat Topcoat Paints: VOC content of not more than 150 g/L.
9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.

16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

D. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one (1) or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.
l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene).
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

## 2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4. Water based pigmented coating with bridging and filling properties for interior or exterior concrete masonry units.

1. Benjamin Moore & Co.
   a. Moorcraft-Super Craft Latex Block Filler 285-01

2. ICI Paints
   a. Devoe Coating-Bloxfil Acrylic Block Filler 4000-1000

3. PPG Architectural Finishes, Inc.
   a. Speedhide-Int/Ext Acrylic Masonry Hi-Fill Block Filler 6-15

4. Sherwin-Williams Company (The)
   a. PrepRite-Int/Ext Block Filler B25W25

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50. Water based pigmented primer/sealer for new interior plaster, concrete and gypsum wallboard.

1. Benjamin Moore & Co.
   a. Moorespec-Int Acrylic Latex Primer/Sealer 253-00

2. ICI Paints
   a. Prep & Prime-Hi-Hide Wall Interior Water Based Primer Sealer 1000-1200

3. PPG Architectural Finishes, Inc.
   a. Speedhide-Int. Latex Primer Sealer 6-2

4. Sherwin-Williams Company (The)
   a. Quali-Kote-Interior Latex Primer B28WB1;B28WQ8001

5. ScuffMaster Architectural Finishes by Wolf Gordon
   a. PrimeMaster Primer/Sealer-Multipurpose Primer for Scrub Tough paint finishes.

B. Interior Alkyd Primer/Sealer: MPI #45. Solvent based pigmented primer/sealer for new interior wood, plaster and porous surfaces, and areas previously painted with flat paints.

1. Benjamin Moore & Co.
   a. Fresh Start-Int/Ext All Purpose Alkyd Primer 024

2. ICI Paints
   a. Prep & Prime-Stain Jammer Int. Solvent Based Primer Sealer 1110-1200

3. PPG Architectural Finishes, Inc.
   a. Seal Grip-Interior Alkyd Enamel Undercoater 17-956

4. Sherwin-Williams Company (The)
   a. PrepRite-Wall and Wood Primer B49W2

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

## 2.5 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79. Solvent based alkyd type anti-corrosive for ferrous metal primarily for field application on new and repainting work.

1. Benjamin Moore & Co.
   a. IronClad-Alkyd Low Lustre Metal & Wood Enamel C163

2. ICI Paints
   a. Devoe Coatings-DevGuard Alkyd Metal Primer 4100-7100

3. PPG Architectural Finishes, Inc.
   a. Speedhide-Int/Ext Zinc Chromate Metal Primer 6-204

4. Sherwin-Williams Company (The)
   a. Kem Kromik-Univeral Metal Primer

B. Rust-Inhibitive Primer (Water Based): MPI #107. Water based anti-corrosive primer for interior or exterior ferrous metals exposed to mildly corrosive environments.

1. Benjamin Moore & Co.
   a. Industrial-Acrylic Metal Primer M04

2. ICI Paints
   a. Devoe Coatings-Devflex DTM Flat Int/Ext W.B. Primer 4020

3. PPG Architectural Finishes, Inc.
   a. Pitt-Tech-Int/Ext Metal/Finish DTM Industrial Enamel 90-712

4. Sherwin-Williams Company (The)
   a. Industrial and Marine-DTM Acrylic Primer/Finish B66W1

C. Waterborne Galvanized-Metal Primer: MPI #134. Water based anti-corrosive primer for cleaned etched galvanized metal.

1. Benjamin Moore & Co.
   a. Industrial-Acrylic Metal Primer M04

2. ICI Paints
   a. Devoe Coatings-Devflex DTM Flat Int/Ext W.B. Primer 4020

3. PPG Architectural Finishes, Inc.
   a. PPG-Int/Ext WB Industrial Primer EP2006-8

4. Sherwin-Williams Company (The)
   a. Industrial and Marine-DTM Acrylic Primer/Finish B66W1

D. Vinyl Wash Primer: MPI #80. Two component vinyl butyral/phosphoric acid wash primer used on clean metal metal surfaces and zinc rich primers used as a tie coat for subsequent priming with anti-corrosive primers or finish coats.

1. PPG Architectural Finishes, Inc.
   a. Polyclutch-Vinyl Wash Primer 97-687/688

2. Sherwin-Williams Company (The)
   a. Industrial and Marine-Industrial Wash Primer P60G2/R7K44

E. Quick-Drying Primer for Aluminum: MPI #95. Solvent based alkyd or modified alkyd Q.D. anti-corrosive primer for use on prepared interior or exterior aluminum surfaces.

1. Benjamin Moore & Co.
   a. Industrial-Alkyd Metal Primer M06

2. PPG Architectural Finishes, Inc.
   a. Speedhide-Int/Ext Zinc Chromate Metal Primer 6-204

3. Sherwin-Williams Company (The)
   a. Kem Kromik-Univeral Metal Primer B50WZ1

## 2.6 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39. Latex based primer for interior wood surfaces.

1. Benjamin Moore & Co.
   a. Fresh Start-Interior/Exterior Primer 023

2. ICI Paints
   a. Devoe-Primz220 Kilstain WB Int/Ext Latex All Purpose Primer/Sealer DR51801

3. PPG Architectural Finishes, Inc.
   a. Seal Grip-Int/Ext Acrylic Latex Stain Blocking Primer 17-21

4. Sherwin-Williams Company (The)
   a. PrepRite-ProBlock Interior Latex Primer/Sealer B51W20

## 2.7 INTERIOR LATEX PAINTS

A. Interior Latex (Flat): MPI #53 (Gloss Level 1). Water based latex-based paint used on primed/sealed interior gypsum board, and on primed wood, and metals.

1. Benjamin Moore & Co.
   a. Super Spec-Latex Flat 275

2. ICI Paints
   a. Dulux Ultra-Velvet Sheen Flat Latex Interior Wall & Trim Finish 1201-XXXX

3. PPG Architectural Finishes, Inc.
   a. Speedhide-Interior Wall Flat Latex 6-70

4. Sherwin-Williams Company (The)
   a. ProMar 200-Interior Latex Flat B30-200

B. Interior Latex (Eggshell): MPI #52 (Gloss Level 3). Water based latex-based paint used on primed/sealed interior gypsum board, and on primed wood, and metals.

1. Benjamin Moore & Co.
   a. Super Spec-Latex Eggshell Enamel C274

2. ICI Paints
   a. Dulux Professional-Acrylic Eggshell Interior Wall & Trim Paint 1403-XXXX

3. PPG Architectural Finishes, Inc.
   a. Speedhide-Interior Enamel Eggshell Latex 6-411

4. Sherwin-Williams Company (The)
   a. ProMar 200-Interior Latex Eggshell B20-2200

C. High-Performance Architectural Paint (Eggshell): MPI #139 (Gloss Level 3). Water based high performance architectural polyurethane-fortified coating designed to provide a significantly higher level of performance than conventional latex paints in areas of scrub, and burnish resistance, and stain removal.

1. ScuffMaster Architectural Finishes by Wolf Gordon
   a. ScrubTough- Interior Performance paint with Microban.

2.8 INTERIOR ALKYD PAINTS

A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5). Solvent based semi-gloss alkyd paint for primed sealed interior gypsum wallboard, wood and metal surfaces.

1. Benjamin Moore & Co.
   a. MooreSpec-Interior Alkyd Semi-Gloss 599 1B

2. ICI Paints
   a. Dulux Ultra Professional-Traditional Semi-Gloss Interior Enamel 1507-0100

3. Sherwin-Williams Company (The)
   a. ProMar 200-Alkyd Semi-Gloss B34W251

B. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6). Solvent based gloss alkyd paint for primed new or previously sealed interior wood and metal surfaces.

1. Benjamin Moore & Co.
   a. Moorecraft-Super Spec Urethane Alkyd Gloss Enamel Z22-08

2. ICI Paints
   a. Devguard-Alkyd Industrial Enamel 4308

3. PPG Architectural Finishes, Inc.

a. Speedhide-Interior Exterior Alkyd Gloss 6-282

4. Sherwin-Williams Company (The)
   a. ProMar 200-Interior Alkyd Gloss B35W251

## 2.9 ALUMINUM PAINT

A. Aluminum Paint: MPI #1. Aliphatic solvent based coating of varnish or alkyd binder combined with aluminum pigment. Used for interior and exterior applications to wood, metals, bituminous coated surfaces.

1. Benjamin Moore & Co.
   a. Moore's-All Purpose Aluminum Paint 138

2. ICI Paints
   a. Devoe Coatings-Devguard Alkyd Aluminum 4308-9020

3. PPG Architectural Finishes, Inc.
   a. Speedhide-Aluminum Paint 6-230

4. Sherwin-Williams Company (The)
   a. Industrial and Marine-Silver-Brite Aluminum B59S11

## 2.10 FLOOR COATINGS

A. Epoxy Penetrating Sealer for Concrete Floors:

1. Sherwin Williams: Epoxy Penetrating Sealer UFY Series.

2. Benjamin Moore: Super Spec HP 100% Solids Epoxy Penetrating Sealer

# 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 (CMU): 12 percent.

3. Wood: 15 percent.
4. 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

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. 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.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

## 3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

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. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.
b. Panelboards.
c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

## 3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove non-complying-paint materials from project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two (2) paints are incompatible.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. 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.

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

## 3.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Latex System: MPI INT 4.2A.

    a. Prime Coat: Interior/exterior latex block filler.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex (eggshell).

B. Steel Substrates:

1. Alkyd System: MPI INT 5.1E.

    a. Prime Coat: Alkyd anticorrosive metal primer.

b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd (semigloss) or (gloss).

2. Aluminum Paint System: MPI INT 5.1M.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Aluminum paint.
c. Topcoat: Aluminum paint.

C. Galvanized-Metal Substrates:

1. Latex Over Waterborne Primer System: MPI INT 5.3J.

a. Prime Coat: Waterborne galvanized-metal primer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex to be selected by Architect.

D. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Latex System: MPI INT 5.4H.

a. Prime Coat: Quick-drying primer for aluminum.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex to be selected by Architect.

2. Alkyd Over Vinyl Wash Primer System: MPI INT 5.4A.

a. Prime Coat: Vinyl wash primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd to be selected by Architect.

3. Aluminum Paint System: MPI INT 5.4D.

a. Prime Coat: Vinyl wash primer.
b. Intermediate Coat: Aluminum paint.
c. Topcoat: Aluminum paint.

E. Gypsum Board Substrates:

1. Latex System: MPI INT 9.2A.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Interior latex matching topcoat.
c. Topcoat: Interior latex (flat) or (eggshell).

2. High-Performance Architectural Paint System: MPI INT 9.2B.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: High-performance architectural matching topcoat.
c. Topcoat: High-performance architectural paint (eggshell).

END OF SECTION

# 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 SECTION INCLUDES

A. Panel signs.

## 1.3 RELATED SECTIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Temporary Project identification signs and for temporary information and directional signs.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Labels, tags, and nameplates for plumbing systems and equipment.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment: Labels, tags, and nameplates for HVAC systems and equipment.

D. Division 26 sections for electrical service and connections for illuminated signs.

E. Section 26 05 53 - Identification for Electrical Systems: Labels, tags, and nameplates for electrical equipment.

F. Section 26 51 00 - Interior Lighting: Illuminated Exit signs.

## 1.4 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

## 1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

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

C. Shop Drawings: Show fabrication and installation details for signs.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
1. Aluminum: For each form, finish, and color, on 6-inch long sections of extrusions and squares of sheet at least 4 by 4 inches.
2. Panel Signs: Manufacturer's full-size unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For fabricator.

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

H. Warranty: Special warranty specified in this section.

## 1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this project and whose products have a record of successful in-service performance.

B. Source Limitations for Signs: Obtain each sign type indicated from one (1) source from a single manufacturer.

C. Regulatory Requirements: Comply with applicable provisions in ICC/ANSI A117.1.

## 1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

## 1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

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

a. Deterioration of metal and polymer finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: Five (5) years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.

B. Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

### 2.2 PANEL SIGNS

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:
   1. APCO Graphics, Inc.
   2. ASI-Modulex, Inc.
   3. Best Sign Systems Inc.
   4. Innerface Sign Systems, Inc.
   5. InPro Corporation
   6. Mohawk Sign Systems.
   7. Seton Identification Products.

B. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16-inch measured diagonally from corner to corner, complying with the following requirements:
   1. Acrylic Sheet: 3mm thick.
   2. PVC Sheet: 2mm thick, extruded, high-impact PVC plastic.
   3. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32-inch above surface with contrasting colors as selected by Architect from manufacturer's full range and laminated to acrylic back.
   4. Edge Condition: Radius.
   5. Corner Condition: Square.
   6. Mounting: As indicated.
      a. Wall mounted with concealed anchors.
      b. Manufacturer's standard anchors for substrates encountered.
   7. Color: As selected by Architect from manufacturer's full range.
   8. Tactile Characters: Characters and Grade 2 Braille raised 1/32-inch above surface with contrasting colors.

C. Panel Sign Frames:
   1. Extruded-Aluminum Frames:
      a. Color: Clear anodized.
      b. Depth: Manufacturers standard.
      c. Profile: Radius.

d. Corner Condition: Square.
e. Mounting: As indicated.

1) Wall mounted with concealed anchors, magnetic tape, or two-face tape to suit substrate.

D. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.

1. Panel Material: Clear acrylic sheet with opaque color coating, subsurface applied.
2. Raised-Copy Thickness: Not less than 1/32-inch.

E. Subsurface Copy: Apply minimum 4-mil thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.

F. Panel Sign Schedule: Refer to drawings for sign style.

## 2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

## 2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.
1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
2. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

## 2.5 FINISHES, GENERAL

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

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

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples.

Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

## 2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018- mm or thicker, over a satin (directionally textured) mechanical finish, complying with AAMA 611.

## 2.7 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five (5) years for application intended.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

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

## 3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within three (3) inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
2. Hook-and-Loop Tapes: Mount signs to smooth, nonporous surfaces.
3. Magnetic Tape: Mount signs to smooth, nonporous surfaces.
4. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
5. Shim Plate Mounting: Provide 1/8-inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
6. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
7. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

C. Bracket-Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

## 3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

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 SECTION INCLUDES

A. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

1.3 RELATED SECTION

A. Section 05 50 00 - Metal Fabrications: Supports that attach floor-and-ceiling-anchored units to overhead structural system.

B. Section 06 10 00 - Rough Carpentry: Blocking.

C. Section 10 28 00 – Toilet Accessories: Toilet tissue dispensers, grab bars, and similar accessories.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of reinforcements for compartment-mounted grab bars.

D. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch square samples of same thickness and material indicated for Work.

1.5 QUALITY ASSURANCE

A. Comply with requirements in CID-A-A-60003, "Partitions, Toilets, Complete."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on shop drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Aluminum Castings: ASTM B26.

B. Aluminum Extrusions: ASTM B221.

C. Brass Castings: ASTM B584.

D. Brass Extrusions: ASTM B455.

E. Stainless steel Sheet: ASTM A666, Type 304, stretcher-leveled standard of flatness.

F. Stainless steel Castings: ASTM A743.

G. Zamac: ASTM B86, commercial zinc-alloy die castings.

### 2.2 PHENOLIC-CORE UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
1. Bobrick Washroom Equipment, Inc.: DuraLine 1081 Series Floor Anchored.
2. Bradley Corporation; Mills Partitions.: Series 500 Floor Braced.
3. General Partitions Mfg. Corp.: Series 30 Floor Supported.

A. Toilet-Enclosure Style: Floor anchored.

B. Urinal-Screen Style: Wall hung.

C. Door, Panel**,** and Pilaster 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 thick doors and pilasters and minimum 1/2-inch thick panels.

D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; fabricated from stainless steel sheet, not less than 0.031-inch nominal thickness and three (3) inches high, finished to match hardware.

E. Brackets (Fittings):
1. Full-Height (Continuous) Double Ear Type: Manufacturer's standard design; extruded aluminum.

F. Phenolic-Panel Finish:

1. Facing Sheet Finish: One (1) color and pattern in each room.
2. Color and Pattern: As selected by Architect from manufacturer's full range with manufacturer's standard dark color core.

## 2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's design, heavy-duty operating hardware and accessories.
   1. Material: clear anodized aluminum.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match hardware, with theft-resistant-type heads. Provide hex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

## 2.4 FABRICATION

A. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

B. Doors: Unless otherwise indicated, provide 24-inch wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch wide clear opening for compartments indicated to be accessible to people with disabilities.
   1. Hinges: Continuous clear anodized aluminum self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
   2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
   3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
   4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance screen doors.
   5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch.

b. Panels and Walls: One (1) inch.

B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than two (2) inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

## 3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION

**GLASS PARTITION SYSTEM** **SECTION 10 23 13**

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 SECTION INCLUDES

A. Full height single glazed partition system.

B. Sliding glass door entrances and hardware.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.4 PERFORMANCE REQUIREMENTS

A. Design Requirements: Design glass partition system to withstand live loads in accordance with applicable Building Code with maximum L/120 deflection.

B. Regulatory Requirements: Provide tempered or laminated safety glass for locations subject to human impact as required by the applicable Building Code.

C. Acoustical Requirements: Sound reduction tested in accordance with BS 2750: Part 3: 1980 and rated in accordance with BS 5281: Part 1: 1984.

1.5 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Include plans, elevations, and details showing type and thickness of metal and glass, glazing, anchoring, and joining, hardware, trim, and accessories.

D. Samples for Verification: For each finish product specified, minimum size 12-inches square representing actual product, color, and patterns.

1. Head and sill channels.
2. Vertical wall trim.
3. Door Frames.
4. Glazing
5. Glass joints.
6. Hardware and Accessories.

## 1.6 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from the installers of the items involved.

1. Suspended-ceiling components and dimensioned ceiling-grid layout.
2. Locations of fixed door and window mullions.
3. Seismic bracing and related structural members.
4. Ductwork above ceiling.

C. Product Certificates: For each type of demountable partition.

D. Product Test Reports: For each type of demountable-partition assembly, for tests performed by manufacturer and witnessed by a qualified testing agency.

## 1.7 CLOSEOUT SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Maintenance Data: For demountable partitions to include in maintenance manuals.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

## 1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Glass partition manufacturer to have minimum five years documented experience in the fabrication of glass partitions of the type required for this project and be capable of providing field service representation during installation.

B. Installer Qualifications: Minimum 2 years documented experience in work of this Section and approved by partition system manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from damage and exposure to moisture.

1.11 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.12 PROJECT CONDITIONS

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

B. Field Measurements: Verify opening dimensions of all-glass partitions by field measurements before fabrication and indicate the measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.13 COORDINATION

A. Coordinate Work with other operations and installation of adjacent surfaces to avoid damage to installed materials.

B. Coordinate work with adjacent floor, wall, and ceiling construction to accommodate frame anchorage, track, and concealed hardware.

C. Coordinate work with concrete floors and floor finishes for adequate tolerances and clearances between panels and floor finish.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions:

1. ASTM B 221, 6063-T6 alloy and temper.
2. Recycled content: Minimum 75 percent, with minimum 40 percent classified as post consumer.

B. Stainless Steel Fittings: Type 304 stainless steel conforming to ASTM A 276.

C. Glass: Clear tempered glass: ASTM C 1048, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select, Kind FT fully tempered, thickness specified.

D. Glazing Gaskets: ASTM C 864, neoprene or EPDM, or ASTM C 1115, silicone or thermoplastic polyolefin rubber, molded or extruded shape to fit glazing channel retaining slot.

E. Fasteners: Type best suited to application.

## 2.2 FULL HEIGHT SINGLE GLAZED PARTITION SYSTEM

A. General: Site-assembled dry glazed glass partition system and components that are the standard products of manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Avanti Systems USA: Solare.

B. System Components:

1. Configuration:
   a. As indicated on the Drawings.

2. Single Glazed.
   a. 1/2 inch (12 mm) clear tempered glass.

3. Head and Sill Channels:
   a. Extruded 1 inch (25 mm) aluminum, 2 piece glazing channels with brush seals.
   b. Hardwood channel track.
   c. Setting blocks provided as required.
   d. Provide end covers or channel end caps as required.

4. Vertical Wall Trim:
   a. Wall/Aluminum: Extruded aluminum 1 inch (25 mm) face size, 2 piece frame with brush seals for glazing joints.
   b. Drywall: Extruded aluminum flush glazing drywall insert with brush seals for glazing joints.

5. Glass Joints:
   a. Vertical Joints: Translucent H sections.

6. Doorframes:
   a. Extruded aluminum slimline door frame with 2 inch by 2-1/4 inch (51 mm by 57 mm) deep, one piece construction and brush seal door seals.

## 2.3 GLASS PARTITION DOORS

A. Sliding Doors:

1. Eclipse frameless surface mounted, sliding glass doors with tempered glass of minimum thickness matching glass partition.

2. Hardware: Frameless surface mounted hardware.
   a. Sliding Door Devices: Top hung solid stainless steel components with roller assembly fitting over exposed 25 mm diameter solid stainless steel support bar with rubber cushioned stops for single and double doors. Tubular rails not permitted.
   b. Overpanel to sidelight connections to be L shaped support brackets. Inline connectors not permitted.
   c. Corner junctions to be variable angle devices. Fixed devices are not permitted.
   d. Tubular Pull: Stainless steel with a brushed finish, 48 inches (1219 mm) long 5/16 inch (8 mm) diameter.

B. Hardware:

1. Lever Model: _____.
2. Knob Model: _____.
3. Cylinder: _____.
4. Closers: Overhead patch type.

## 2.4 FABRICATION

A. General: Fabricate glass partitions for installation with concealed fastening devices and pressure-fit members that will not damage ceiling or floor coverings. Fabricate systems for installation with continuous seals at floor, ceiling, and other locations where partitions abut fixed construction.

B. Accurately fit and secure joints and intersections.

C. Make joints flush and hairline.

D. Prepare components to receive anchor devices and hardware. Fabricate anchorage items.

E. Arrange fasteners, attachments, and jointing to ensure concealment from view.

## 2.5 GENERAL FINISH REQUIREMENTS

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

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

## 2.6 ALUMINUM FINISHES

A. Finish to be selected by Architect from the following selections:

B. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker clear anodic coating over a mechanical finish.

C. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker over a mechanical finish.

D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

## 2.7 STAINLESS STEEL FINISHES

A. General: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish free of cross scratches.

1. Directional Finishes: Run grain of directional finishes.
2. Passivation: When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved Shop Drawings.

B. Use anchorage devices to securely attach assembly to structure.

C. Install components plumb and level, in proper plane, free from warp and twist.

D. Install glass and accessories in accordance with GANA Glazing Manual.

E. Installation Tolerances:

1. Maximum variation from plumb or level: 1/8 inch in 3 feet or 1/4 inch in any 10 feet, whichever is less.
2. Maximum misalignment of members abutting end to end: 1/16 inch.

## 3.2 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Adjust doors to operate smoothly and easily, without binding.

C. Check and readjust operating hardware. Verify that latches and locks engage accurately and securely without forcing or binding; lubricate as recommended by manufacturer.

D. Clean soiled surfaces to remove dirt, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

E. Remove and replace defaced or damaged components.

END OF SECTION

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**TOILET ACCESSORIES** **SECTION 10 28 00**

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 SECTION INCLUDES

A. Toilet and washroom accessories.

B. Underlavatory guards.

C. Custodial accessories.

1.3 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry: Blocking for mounting toilet accessories to walls.

B. Section 09 30 00 - Tiling: Ceramic wall tiles.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for project.
5. Manufacturer's warranty.

C. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

1. Approved full-size samples will be returned and may be used in the Work.

D. 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.

E. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

F. Warranty: Sample of special warranty.

## 1.5 QUALITY ASSURANCE

A. Codes: Comply with applicable Building Code and standards.

B. Standards:
   1. Americans With Disabilities Act (ADA) July 1991.
   2. International Code Congress/American National Standards Institute (ICC/ANSI A117.1-98): Specifications for making building and facilities accessible to and usable by the physically handicapped.
   3. Uniform Federal Accessibility Standards, 1999.

C. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

D. References:
   1. American Society for Testing and Materials (ASTM):
      a. ASTM A167-96 Specification for Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet and Strip (22 Gage Minimum).
      b. ASTM A269-96 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
      c. ASTM A-653-97 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, Commercial Quality.
      d. ASTM C-1048-97b Specification for Heat Treated Glass, Kind HS, Kind FT, Coated and Uncoated Glass.

E. 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.

## 1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## 1.7 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 MATERIALS

A. Stainless Steel: ASTM A666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A653, with G60 hot-dip zinc coating.

E. Galvanized-Steel Mounting Devices: ASTM A153, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

H. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 MANUFACTURERS

A. -of-Design Product: Subject to compliance with requirements, provide the product specified by or a product of another manufacturer of equal or better quality and performance as approved by the Architect:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.

2.3 TOILET AND WASHROOM ACCESSORIES

A. Grab Bar: Accessory Ref #

1. Basis-of-Design Product: Bobrick Model #B-6806 x 36.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05-inch thick.
   a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Straight, 36 inches long (Horizontal Mount).

B. Grab Bar: Accessory Ref #.

1. Basis-of-Design Product: Bobrick Model #B-6806 x 42.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05-inch thick.
   a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Straight, 42 inches long (Horizontal)

C. Grab Bar: Accessory Ref #

1. Basis-of-Design Product: Bobrick Model # B-6806 x 18.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05-inch thick.
   a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Straight, 18 inches long (Vertical).

D. Toilet Tissue (Multi-Roll) Dispenser: Accessory Ref #

1. Basis-of-Design Product: Bobrick Model #B-4888 Contura Series
2. Description: Multi-Roll Toilet Tissue Dispenser.
3. Mounting: Surface-mounted.
4. Capacity: Designed to hold two (2) standard core toilet tissue rolls up to 5-1/4-inch diameter (1800 sheets).
5. Spindles: Theft-resistant, heavy-duty, one-piece, molded ABS; two (2).
6. Material and Finish: Stainless steel, No. 4 finish (satin).
7. Tumbler lock keyed to match other toilet accessories.

E. Toilet Tissue (Single) Dispenser: Accessory Ref #
1. Basis-of-Design Product: Kohler - Loure #K-11584.
2. Description: Single-roll holder, with cover.
3. Mounting: Surface mounted.
4. Capacity: Designed for standard rolls up to 5-1/2inch diameter tissue rolls.
5. Material and Finish: Metal; Polished Chrome Finish.

F. Toilet Seat-Cover Dispenser: Accessory Ref #

1. Basis-of-Design Product: Georgia Pacific Professional Safe-T Gard Model #57748.
2. Mounting: Surface mounted.
3. Minimum Capacity: 250 seat covers.
4. Exposed Material and Finish: High impact plastic, Black.

G. Sanitary-Product Disposal Unit: Accessory Ref #

1. Basis-of-Design Product: Bobrick Model #B-4354 Contura Series
2. Mounting: Partition Mounted for Two Toilet Compartments.
3. Door or Cover: Self-closing, disposal-opening cover with ABS sight barrier.
4. Receptacle: Removable leak proof polyethylene receptacle.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

H. Liquid-Soap Dispenser: Accessory Ref #

1. Basis-of-Design Product: Bobrick Model #B-306
2. Description: Push-in piston dispenser designed to deliver soap in liquid or lotion form.
3. Mounting: Recessed Mounting Box.
4. Capacity: 45 oz.
5. Materials: Stainless steel with No. 4 satin finish.
6. Container: Translucent polyethelene, re-fillable.
7. Lockset: Tumbler type.
8. Refill Indicator: Window type.

I. Robe Hook: Accessory Ref #
1. Basis-of-Design Product: Kohler - Loure Model # K-11585
2. Description: Single-prong unit.
3. Material and Finish: Metal; Polished Chrome Finish.

J. Medicine Cabinet: Accessory Ref #
1. Basis-of-Design Product: Kohler - Catalan Model # K-29_ _ PG.
2. Mounting: Recessed, or Surface mounted - to be selected by Architect.
3. Size: To be selected by Architect.
4. Door: Reversible door concealing storage cabinet equipped with self closing continuous hinge with mirror on front and back of door and interior back of cabinet.
5. Shelves: Four (4), adjustable.
6. Material and Finish:

    a. Cabinet: Anodized aluminum - Satin.
    b. Door: Polymer.
    c. Shelves: Glass - Black tinted.
7. Option: Side mirror kit for surface mounted installations Model #K-2878.

K. Towel Bar: Accessory Ref #

1. Basis-of-Design Product: Kohler - Purist Model #K-14435
2. Description: Round tube with round end brackets.
3. Mounting: Flanges with concealed fasteners.
4. Length: 18 inches.
5. Material and Finish: Metal; Polished Chrome Finish.

L. Mirror Unit: Accessory Ref #.

1. Basis-of-Design Product: www.modernbathroom.com SKU: SLT401.
2. Mirror: Tempered Glass.
3. Size: 24 by 36-inch.

M. Mirror Unit: Accessory Ref #.

1. Basis-of-Design Product: Kimball & Young, Inc www.decorisland.com SKU: 24043 by Mirror Image .

2. Description: Articulating pivot arm wall mirror.
3. Mirror: Tempered Glass.
4. Size: 11.75”h by 9.5”w by 7.75:L.

## 2.4 WARM-AIR DRYERS

A. Warm-Air Hand Dryer: Accessory Designation:
1. Basis-of-Design Product: The Dyson Airblade – Dyson Corp.
2. Mounting: Surface mounted.
3. Operation: Touch free infra-red sensor activated.
   a. Hand Dry Operation Time: 12 seconds.
4. Cover Material and Finish: Die-cast aluminum casing with anti-microbial scuff resistant lacquer coating on exterior surfaces.
5. Color: Metallic silver, gloss.
6. Electrical Requirements: 120 V, 60 Hz.
7. Filtration: HEPA filter with anti-microbial coating.
8. Rated noise power: 84db (A).
9. Warranty: 5 years parts and, 1 year labor.

## 2.5 UNDERLAVATORY GUARDS

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:
1. Plumberex Specialty Products, Inc. Pro-Extreme
2. Truebro, Inc. Lav Guard2

B. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
1. Material and Finish: Antimicrobial, molded-plastic, white.

## 2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying.

## 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, when tested according to ASTM F446.

### 3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

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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 SECTION INCLUDES

A. All glass shower door.

1.3 RELATED SECTIONS

A. Section 07 92 00 – Joint Sealants: Clear silicone caulk sealant.

B. Section 09 30 00 - Tiling: Ceramic wall toilet.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts and substrate preparation.
3. Material and finish descriptions.
4. Manufacturer's warranty.

C. Maintenance Data: To include in maintenance manuals.

D. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

## 1.6 COORDINATION

A. Coordinate locations with other work to prevent interference with clearances required, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

## 1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to replace or repair or make appropriate adjustment in materials or workmanship occurring in normal usage within specified warranty period.

1. Warranty Period: One (1) years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 ALL GLASS SHOWER DOOR

A. Frameless glass shower door with pivot door hinges and glass sidelite.

B. Manufacturers: Subject to compliance with requirements, provide the following:

1. Kohler: Purist Pivot Shower Door; Model #K-705716-L.
   a. Hardware Model #K-705763.

## 2.2 MATERIALS

A. Heat-Treated Float Glass: ASTM C1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Fully tempered float glass, comply with requirements for Kind FT.
2. Thickness: 1/2-inch for door and sidelite.
3. Provide glass with CleanCote glass coating.

B. Hardware and frame finish: Bright polished silver (SHP).

C. Fasteners: Corrosion resistant stainless steel/brass fasteners.

## 2.3 FABRICATION

A. General: Fabricate units for out-of-plumb or out-of-level adjustability to allow for easy installation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install shower door 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 indicated.

### 3.2 ADJUSTING AND CLEANING

A. Adjust shower door for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

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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 SECTION INCLUDES

A. Fire protection cabinets for the following:
   1. Portable fire extinguishers.

1.3 RELATED SECTIONS

A. Section 10 14 00 - Signage: Directional signage to out-of-sight fire extinguishers and cabinets.

B. Section 10 44 16 - Fire Extinguishers.

1.4 PROJECT REQUIREMENTS

A. Fire extinguisher cabinets shall comply with Patient Safety Standards, Materials and Systems Guidelines recommended by the New York State Office of Mental Health.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
   2. Show location of knockouts for hose valves.

C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

D. Samples for Verification: For each type of exposed finish required, prepared on samples of size indicated below:

1. Size: 6 by 6 inches square.

E. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

F. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

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. Preinstallation Conference: Conduct conference at project site.

1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:

a. Schedules and coordination requirements.

## 1.7 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks 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 A1008, Commercial Steel (CS), Type B.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 6mm thick, with Finish 1 (smooth or polished).

## 2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Basis of Design Products: Subject to compliance with requirements, provide the product specified or a product of equal or better quality and performance from the following manufactuers:
    a. Basis of Design: J. L. Industries, Inc., a division of Activar Construction Products Group; Cosmopolitan CADA 1035W10 FX Lockable with Lexan lens.
    b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
    c. Larsen's Manufacturing Company.
    d. Potter Roemer LLC.

B. Cabinet Construction: Non-rated, 1-hour fire rated or 2-hour fire rated cabinet to match rating of wall assembly in which cabinet is installed.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch thick, cold-rolled steel sheet lined with minimum 5/8-inch thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel sheet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Stainless steel sheet.

F. Door Material: Stainless steel sheet.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Acrylic sheet.

1. Acrylic Sheet Color: Clear transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide non-loopable ADA pull with cam-action latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

J. 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. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

K. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:
   a. Interior of cabinet.
2. Stainless Steel: No. 4.

## 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.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2-inch thick.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one (1) piece with corners mitered, welded, and ground smooth.

## 2.4 GENERAL FINISH REQUIREMENTS

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

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

C. Finish fire protection cabinets after assembly.

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

## 2.5 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning". After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Factory Prime Finish: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of two (2) mils.

1. Color and Gloss: Manufacturer's standard white.

## 2.6 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: No. 4.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.

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

## 3.2 PREPARATION

A. Prepare recesses for recessed and semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

## 3.3 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
2. Provide inside latch and lock for break-glass panels.

3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

## 3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturers written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. 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

# 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 SECTION INCLDES

A. Portable, hand-carried fire extinguishers.

## 1.3 RELATED SECTIONS

A. Section 10 44 13 - Fire Extinguisher Cabinets.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

C. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function.

D. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

E. Warranty: Sample of special warranty.

## 1.5 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.

## 1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

## 1.7 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 (6) 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 and mounting bracket indicated.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Amerex Corporation.
      b. Ansul Incorporated; Tyco International Ltd.
      c. Badger Fire Protection; a Kidde company.
      d. Fire End & Croker Corporation.
      e. J. L. Industries, Inc.; a division of Activar Construction Products Group.
      f. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
      g. Larsen's Manufacturing Company.
      h. Potter Roemer LLC.
   2. Valves: Manufacturer's standard.
   3. Handles and Levers: Manufacturer's standard.
   4. 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 in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with mono-ammonium phosphate-based dry chemical in enameled-steel container.
   1. Location: General Area.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION

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# 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 SECTION INCLUDES

A. Cooking appliances.

B. Refrigeration appliances.

## 1.3 RELATED SECTIONS

A. Section 22 40 00 - Plumbing Fixtures: Kitchen sinks, waste disposers, and instant hot-water dispensers.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.

C. Product Schedule: For appliances. Use same designations indicated on Drawings.

D. Qualification Data: For qualified **installer**.

E. Product Certificates: For each type of appliance, from manufacturer.

F. Field quality-control reports.

G. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

H. Warranties: Sample of special warranties.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this project.

B. Source Limitations: Obtain residential appliances from single source.

C. Regulatory Requirements: Comply with the following:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

D. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

E. Preinstallation Conference: Conduct conference at [**project site**] [**Insert location**].

## 1.6 WARRANTY

A. Microwave Oven: Limited warranty including parts and labor for first year.

1. Warranty Period: One (1) years from date of Substantial Completion.

B. Refrigerator/Freezer, Sealed System: Limited warranty including parts and labor for first year and parts thereafter for on-site service on the product.

1. Warranty Period for Sealed Refrigeration System: Five (5) years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 MICROWAVE OVENS

A. Manufacturers: Subject to compliance with requirements, provide the following:

1. General Electric Company (GE).

B. Microwave Oven:

1. Basis-of-Design Product: GE Countertop Microwave Oven #JEB1860SM.
2. Mounting: Countertop.
3. Type: Conventional.
4. Dimensions:

a. Width: 23-7/8 inches.
b. Depth: 18-13/16 inches.
c. Height: 13 9/16 inches.

5. Capacity: 1.8 cu ft.
6. Oven Door: Door with observation window and push-button latch release.

7. Exhaust Fan: Manufacturer's standard capacity.
8. Microwave Power Rating: 1100 W.

9. Electric Power Supply: 120 V, 60 Hz, 1 phase, 15 A.
10. Controls: Digital panel controls and timer display.
11. Other Features: Turntable.
12. Material: Stainless steel.

## 2.2 REFRIGERATOR/FREEZERS

A. Manufacturers: Subject to compliance with requirements, provide the following:

1. General Electric Company (GE).

B. Refrigerator/Freezer: Two-door, side-by-side refrigerator/freezer and complying with AHAM HRF-1.

1. Basis-of-Design Product: General Electric Company (GE). #CSCP5UGX.
2. Type: Freestanding.
3. Dimensions:

   a. Width: 36 inches.
   b. Depth: 29-3/4 inches.
   c. Height: 72 inches.

4. Storage Capacity:

   a. Refrigeration Compartment Volume: 15.28 cu ft.
   b. Freezer Volume: 9.32 cu ft.

5. General Features:

   a. Door Configuration: Overlay.
   b. Dispenser in door for ice and cold water.
   c. Built-in water filtration system.
   d. Dual refrigeration systems.
   e. Separate touch-pad temperature controls for each compartment.

6. Refrigerator Features:

   a. Interior light in refrigeration compartment.
   b. Compartment Storage: Vegetable crisper and meat compartment.
   c. Door Storage: Modular compartments.
   d. Temperature-controlled meat/deli bin.

7. Freezer Features: One (1) freezer compartment.

   a. Automatic defrost.
   b. Interior light in freezer compartment.
   c. Automatic icemaker and storage bin.

8. Appliance Color/Finish: Stainless steel.

## 2.3 GENERAL FINISH REQUIREMENTS

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

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

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

C. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.

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

## 3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: See Divisions 22 and 26 for plumbing and electrical requirements.

## 3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

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. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. An appliance will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

## 3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

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**ROLLER WINDOW SHADES** **SECTION 12 24 13**

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 SECTION INCLUDES

A. Manually operated roller shades.

1.3 ACTION SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: For each type of product.
   1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

C. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

D. Samples for Verification: For each type of roller shade.
   1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
   2. Installation Accessories: Full-size unit, not less than 10 inches long.

E. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Qualification Data: For installer.

C. Product Certificates: For each type of shadeband material, signed by product manufacturer.

D. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

## 1.5 CLOSEOUT SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Maintenance Data: For roller shades to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Mockups: Build mockups to verify selections made under sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

## 1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on shop drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. -of-Design Product: Subject to compliance with requirements, provide the product specified or a product of another manufacturer of equal or better quality and performance as approved by the Architect:
   1. Basis of Design Product: Systems, Inc; Mecho /5.
   2. Draper Inc.: Manual FlexShade

3. Solar Control Inc.; Hunter Douglas Company: Manual Interior Roller Shade.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

## 2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS – WT-1

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Stainless steel.
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer Type: Clip, jamb mount.
   2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.
      a. Provide for shadebands that weigh more than 10-lbs or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: Right side of inside face of shade.
   2. Direction of Shadeband Roll: Regular, from back of roller.
   3. Shadeband-to-Roller Attachment: Manufacturer's standard method.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:
   1. Shadeband Material: Light-filtering fabric.
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Installation Accessories:
   1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
      a. Shape: L-shaped.

b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than four (4) inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

## 2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric:
1. Source: Roller-shade manufacturer.
2. Type: Woven polyester and PVC-coated polyester.
3. Style: Designer Collection 5100 Series Oxford Row; Woven fabric, stain and fade resistant.
4. Weave: Diagonal Weave.
5. Thickness:
6. Weight:
7. Roll Width: Stocked 96-inches.
8. Openness Factor: Five (5) to Six (6) percent.
9. Color: 5102 Pearl.

## 2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 degrees F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less ¼-inch per side or 1/2-inch total, plus or minus 1/8-inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less ¼-inch, plus or minus 1/8-inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams

as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one (1) partial roll-width panel located at top of shadeband.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

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

### 3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

### 3.3 ADJUSTING

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

### 3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, which ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

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# SECTION 23 00 01 - SEISMIC DESIGN

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. This Section includes general and procedural requirements for the design of vibration and seismic controls for all the mechanical, electrical, plumbing and fire protection components and installations within, on or outdoors of the building.

B. This specification is part of the General Conditions for the HVAC, Plumbing, Electrical and Fire Protection contracts.

C. Drawings and general provision of contract, including General and Supplementary Conditions and Division 01 specifications, apply to this section.

D. It shall be understood that the requirements of this seismic section are complementary to requirements delineated under other sections of this work for the support, fastening, seismic restraints and isolating of equipment, components, ductwork, piping and conduit work. Nothing on the drawings or specifications shall be interpreted as a reason to waive the requirements of this seismic, wind and flood load design section.

E. Note that the requirements for vibration control are specified under another section of this work.

F. Vibration isolators and seismic restraints are specified under another section of this work.

G. Seismic bracing and isolation materials shall be the certified products of the same manufacturing group and shall be certified by that group.

H. It is the intent of the Section of the specification to keep all mechanical, electrical, plumbing and fire protection building system components in place during a seismic event and operational.

I. All such systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturers or construction standards, the most stringent installation practice shall apply.

J. This specification is considered to be minimum requirements for seismic, control consideration. Whenever a conflict occurs between the specifications and the code or within the specification or drawings themselves, the most stringent practice shall apply.

K. Any variation which results in non-compliance with the specification requirements shall be corrected by the contractor in an approved manner, at no additional cost.

L. The work in this section includes, but is not limited to, the following:

1. Seismic design requirements for equipment (components).

2. Certification of seismic restraint designs and installation supervision.

3. Certification of attachment of housekeeping pads.

4. All equipment (components) requiring Building Code compliance.

5. All inspection and test procedures for equipment (components) requiring Building Code compliance.

6. All mechanical, electrical, plumbing or fire protection equipment, conduit and pipe, within, on or outdoors of the building. Equipment buried underground is included if essential to the building's function. Entry of services to the building, up to but not including the utility connection, is part of this Specification. Equipment referred to below is typical. (Equipment not listed is still included as part of this specification.) All systems that are part of the building in any way are referred to as components, including:

    a. AC Units
    b. Air Handling Units
    c. Air Separators
    d. Cabinet Unit Heaters
    e. Cable Trays
    f. Compressors
    g. Computer Room Units
    h. Curbs
    i. Dry Coolers
    j. Ductwork
    k. Electrical Panels
    l. Equipment Supports
    m. Fans (all types)
    n. Fan Coil Units
    o. Fire Alarm Panels
    p. Heat Exchangers
    q. Humidifiers
    r. Light Fixtures
    s. Motor Control Centers
    t. Pipe
    u. Pumps (all types)
    v. Risers
    w. Rooftop Units
    x. Supports
    y. Transformers
    z. Unit Heaters
    aa. Variable Frequency Drives
    bb. Vibration Isolators
    cc. Water Heaters

7. Note that the requirements for Vibration Control are included in this section for coordination purposes only.

M. ~~This project requires compliance with IBC, having a seismic importance factor of 1.0 and greater NYSBC, Occupancy Category IV. Seismic restraints shall be provided for all MEP/FP systems and equipment.~~ **This project requires compliance with NYSBC, Occupancy Category IV. Seismic restraints shall be provided for all MEP/FP systems and equipment having a seismic importance factor of 1.0 and greater.**

N. As part of the work, this trade shall engage the services of an independent Licensed Professional Engineer in the state of NY, with experience in the field of equipment support and seismic and wind restraints.

O. This work shall be coordinated with the vibration isolation requirements as specified under another section of the work.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. In the event that this section conflicts with the isolation or seismic requirements of other sections, the more stringent criteria stated herein shall apply.

B. Section 23 05 00 - Basic Mechanical Requirements.

C. Section 23 05 47 - Vibration Isolation.

D. Section 23 05 48 - Foundation, Vibration Isolation & Supports for Rigidly Supported Equipment.

E. Section 23 05 50 - Basic Materials, Methods and Requirements (Mechanical).

F. Section 26 05 00 - Common Work Results for Electrical.

G. This section is a part of Each Division 23 Section.

H. This section is a part of Each Division 26 Section.

1.3 APPLICABLE PUBLICATIONS CODES AND STANDARDS

A. All City, State and Local Codes (New York State Building Code - NYSBC)

B. NFPA 70 - National Electric Code

C. International Energy Conservation Code

D. SMACNA Guidelines for Seismic Restraint of Mechanical Systems (To be used as a Standard, not code)

E. NFPA 13 and 14 for Fire Protection System (Standard)

F. American Society For Testing and Materials (ASTM) (Standard)

G. International Conference of Building Officials (ICBO) (Standard)

H. VISCMA (Vibration Isolation and Seismic Controls Manufacturers Association)

I. American National Standard Institute (ANSI):

J. Air Moving and Conditioning Association (AMCA):

K. American Society of Mechanical Engineers (ASME):

L. National Fire Protection Association (NFPA):

M. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

N. Occupational Safety and Health Administration (OSHA).

O. Underwriters Laboratories (UL).

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and as specified in Division 01 Section "SUBMITTALS."

B. Prior to purchasing any equipment or materials, a list of their manufacturers shall be submitted for review.

C. The manufacturer of vibration isolation, and seismic, restraints shall provide submittals for products and materials as follows:

1. Descriptive Data:

a. Catalog cuts and data sheets on specific vibration isolators and seismic restraints to be utilized showing compliance with the specifications.
b. An itemized list showing the items of equipment or piping to be isolated, the isolator type and model number selected, isolator loading and deflection, and reference to specific drawings showing seismic restraints, base and construction where applicable.
c. An itemized list of non isolated equipment, piping, and ductwork to be seismically restrained.
d. Seismic restraint calculations.
e. Seismic restraints for isolated equipment.
f. Seismic restraints for non-isolated equipment.
g. Certification of seismic restraint designs and installation supervision.
h. Certification of seismic attachment of housekeeping pads.
i. All equipment (components) requiring NYSBC certification.

D. Shop Drawings:

1. Drawings showing equipment base constructions including dimensions, structural member sizes and support point locations.

2. Drawings showing details of suspension and support for ceiling hung equipment.

3. Drawings showing methods for isolation of pipes and ductwork piercing walls and slabs.

4. Concrete and steel details for bases, including anchor bolt locations.

5. Number, location and details of seismic restraints and anchors for each piece of equipment and of ductwork and piping.

6. Specific details of restraints, including anchor bolts for mounting and maximum loading at each location for each piece of equipment and lengths of ductwork and piping.

7. Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts and pipe must be included and reviewed before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic/wind loads at all attachment and support points.

8. Calculation shall be submitted for review. All calculations shall be stamped by the Licensed Professional Engineer.

9. Drawings and calculations (by the licensed professional engineer) substantiating the mounting system, the number and location of seismic restraints and specified details of restraints including anchor bolts for mountings and maximum load (static plus dynamic) expected at each restraint or snubbing device including fastening devices for the seismic restraints which are capable of maintaining equipment, piping or ductwork in a captive position. Restraint devices shall be designed and selected to meet seismic requirements, as defined in the latest NYSBC and as specified herein.

E. Provide Approved Agencies Certificate of Compliance showing compliance with sections 16 and 17 of the NYSBC and ASCE Section 705 for all components. Tests shall include anchorage, structural and on line capability from analytical or shaker test method.

1. Where the requirements of this specification cannot be met by any vendor, the contractor will submit a written summary indicating the lack of resources clearly indicating that none of the specified, listed or other vendors known to the contractors meet the compliance, testing and certification portions of the NYSBC Sections 16 and 17. Special inspections shall still be conducted even if no vendors meet the requirements.

F. Documents will not be accepted for review unless:

1. They include complete information pertaining to appurtenances and accessories.

2. They are submitted as a package where they pertain to related items.

3. They are properly marked with service or function, project name, where they consist of catalog sheets displaying other items which are not applicable.

4. They indicate the project name and address along with the Contractor's name, address and phone number.

5. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

6. All documents are to be stamped, sealed and signed by the licensed Professional Engineer whose services were engaged by this trade contractor.

1.5 QUALITY ASSURANCE

A. All vibration isolation and seismic restraint devices shall be the product of a single manufacturer.

B. The following manufacturers will be reviewed for approval, provided their systems strictly comply with the design intent for performance, deflection and structural capacity of this specification.

| | | |
|---|---|---|
| 1. | Vibration Mountings & Controls | Bloomingdale, NJ |
| 2. | Korfund Dynamics Corp. | Bloomingdale, NJ |
| 3. | Amber Booth | Houston, TX |

C. Vibration isolation firms having a minimum of ten (10) years experience in designing and installing vibration isolation and seismic restraint systems shall be qualified to provide the materials and installation required by this section. Project listings shall be provided including geographical location and a reference contact.

D. The installation of all vibration isolation units and associated seismic restraints hangers and bases, shall be under the direct supervision of the vibration isolation manufacturers' representative.

E. Manufacturer of vibration isolation, seismic and wind load control equipment shall have the following responsibilities:

1. Determine vibration isolation and restraint sizes and locations.

2. Provide vibration isolation and restraints as scheduled or specified.

3. Provide calculations and materials if required for restraint of nonisolated equipment.

4. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.

5. Certify correctness of installation upon completion.

6. All provisions of Section 1.4, General Design & Performance Requirements.

F. All manufacturers, including Original Equipment Manufacturers (OEM), providing equipment and/or vibration control, or seismic, restraining systems must provide a Seismic Design Error and Omissions Insurance Certificate for their firm or their design consultant to certify their ability to provide engineering and design as required by this section.

G. All manufacturers of any type of equipment including OEM are responsible to meet all the requirements as specified herein.

H. Equipment manufacturers' substitution of internally or externally isolated and/or restrained equipment supplied by the equipment vendor, in lieu of the isolation and restraints specified in this Section, is acceptable provided all conditions of this Section are met. The Equipment manufacturer shall provide a letter of guarantee from their Engineering Department, PE stamped and certified stating that the seismic restraints are in full compliance with these specifications. Manufacturer's certification proving on line capability shall be required in addition to all requirements stated herein. Letters from field offices or representatives are unacceptable.

I. All costs for converting to the specified vibration isolation and/or restraints shall be borne by the equipment vendor in the event of non-compliance with the preceding. Substitution of internal isolation is unacceptable for:

1. Indoor or outdoor mounted equipment over or adjacent to:

a. Patient or operating areas
b. Office locations
c. Assembly areas

J. Testing or calculating (including the combining of tensile and shear loadings) to support seismic restraint designed must be stamped by the licensed Professional Engineer. Testing and calculations must include shear and tensile loads as well as one test or analysis at 45 degrees to the weakest mode.

K. Component testing must be by an approved agency.

L. Analysis for anchorage must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces acting through the equipment center of gravity. Overtuning moments may exceed forces at ground level.

M. A seismic design Errors and Omissions insurance certificate MUST accompany the equipment manufacturer's certification. Product liability insurance certificates are not acceptable.

N. In the event that the equipment is internally isolated and restrained, the entire unit assembly must be seismically attached to the structure. Curb or roof rail mounted equipment must not only have seismic attachment of the equipment must not only have seismic and wind attachment of the equipment to the roof but also to the curb or rails. The attachment and certification thereof shall be as specified herein.

1.6 DEFINITIONS (BUILDING AND COMPONENTS)

A. Essential Facilities

1. Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes.

B. Life Safety and High Hazard:

1. All systems involved with fire protection including but not limited to sprinkler piping, jockey pumps, fire pumps, control panels, service water supply piping, water tanks, fire dampers, smoke exhaust systems and fire alarm panels. (Life Safety).

2. All mechanical, electrical, plumbing or fire protection systems that support the operation of, or are connected to, emergency power equipment including but not limited to, all lighting, generators, fuel oil systems, transfer switches and transformers. This also includes critical, standby or emergency power components including conduit (1" nominal diameter and larger) cable tray or bus duct, lighting, panels, communication lines involving 911, etc. (Life Safety).

3. Medical gas, steam, compressed air or any piping containing hazardous, flammable, combustible, toxic or corrosive materials. Fire protection standpipe, risers and mains. Branches must be end tied.

4. Smoke evacuation duct or fresh air make up connected to emergency system, or as used by the fire department on manual override.

5. Non life safety duct mounted systems such as fans, variable air volume boxes, heat exchangers and humidifier shaving a weight greater than 75 lbs require independent seismic bracing.

6. All medical and life support systems. (Life Safety)

7. Hospital heating systems and air conditioning systems for maintaining normal ambient temperature. (Life Safety)

8. Automated supply, exhaust, fresh air and relief air systems on emergency control sequence, including air handlers, duct, dampers, etc.. or manually operated systems used for smoke evacuation, purge or fresh air relief. (Life Safety).

9. All gases or fluids which must be contained in a closed system which are flammable or combustible including but not limited to gas piping. Any gas which poses a health hazard if released into the environment including but not limited to, medical gas piping, compressed air piping. (High Hazard).

10. Heating systems in any facility in Use Group III, IBC-2000 or Occupancy Category IV, IBC-2003-2006 where the ambient temperature can fall below 32 degrees Fahrenheit. (Life Safety).

C. Anchor: A device, such as an expansion bolt, for connecting duct or pipe bracing members into the structure of a building.

D. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.

E. Attachment: See Positive Attachment below.

F. Bracing: Metal channels, cable or hanger angles that prevent components from breaking away from the structure during an earthquake. See also Longitudinal Bracing and Transverse Bracing. Together, they resist lateral loads from any direction.

G. Certificate of Compliance: A certificate stating that materials and products meet specified standards or that work was done in compliance with approved construction documents provided by an approved agency. (Certificate to be supplied by equipment component manufacturer).

H. Component: A non-structural part or element of an architectural, electrical, lighting, mechanical, plumbing or fire protection system within or without of a building system.

I. Dynamic properties or piping: The tendency of pipe to change in weight and size because of the movement and temperature of fluids in them. This does not refer to movement due to seismic forces.

J. Equipment: Systems associated with ducts, pipe and conduit also called components.

K. Hazardous Contents: A material that is highly toxic or potentially explosive or corrosive and in sufficient quantity to pose a significant life-safety threat to the general public if an uncontrolled release were to occur.

L. Inspection Certificate: An identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics, and the name and identification of an approved agency that indicates that the product or material has been inspected and evaluated by an approved agency.

M. Isolation System: The collection of structural elements that includes individual isolator units, structural elements that transfer force between elements of the isolation system and connections to other structural elements.

N. Label: An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the same and identification of an approved agency and that indicated that the representative sample of the product or materials has been tested and evaluated by an approved agency.

O. Lateral Forces: A force acting on a duct or pipe in the horizontal plane. This force can be in any direction.

P. Licensed Professional Engineer: An independent, qualified, licensed Professional Engineer having PE registration from the same state as the project, with significant experience in the field of seismic design, wind design, equipment support and seismic restraints.

Q. Load, Gravity Load (W): The total dead load and applicable portions of other loads as defined in IBC.

R. Longitudinal Bracing: Bracing that prevents a component from moving in the direction of its run.

S. Longitudinal Force: A lateral force that happens to be in the same direction as the duct or pipe.

T. Mark: An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material (see also "Inspection Certificate", "Label" and "Manufacturer's Designation").

U. Manufacturer's Designation: An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules.

V. Occupancy Category: A classification used to determine structural load requirements including those imposed by wind, flood, snow and seismic based on occupancy of the structure.

W. Occupancy Importance Factor: A factor assigned to each structure according to its Seismic Use Group as prescribed in NYSBC.

X. Positive Attachment: A mechanical device designed to resist seismic forces that connected a non-structural element, such as a duct, to a structural element, such as a beam. Bolts and welding are examples of positive attachments. Surface glue and friction anchorage do not constitute positive attachment. Examples of positive attachment are epoxy cast in anchors and drill in wedge shaped anchor bolts to concrete and welded or bolted connections directly to the building structure. Doublesided beam clamps, C type are not acceptable as either brace point attachments to the structure of for the support of the component at the bracing location.

Y. Seismic Design Category: A classification assigned to a structure based on its Seismic Use Group or occupancy category and the severity of the design earthquake ground motion at the site.

Z. Seismic Force: The assumed forces prescribed herein, related to the response of the structure to earthquake motions, to be used on the design of the structure and its components.

AA. Seismic Use Group, Occupancy Category: A classification assigned to a building based on its use as defined in NYSBC.

BB. Seismic: Related to an earthquake. Seismic loads on a structure are caused by wave movements in the earth during an earthquake.

CC. Site Class: A classification assigned to a site based on the types of soils present and their engineering properties as defined in NYSBC.

DD. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

EE. Special Inspection, Periodic: The part-time ir intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

FF. Special Inspection: Inspection as herein required of the materials, installation, fabrication, erection or placement of components and connections requiring special documents and referenced standards.

GG. Transverse bracing: Bracing that prevents a component from moving from side to side.

1.7 GENERAL DESIGN AND PERFORMANCE REQUIREMENTS

A. General Design Requirements.

1. SEISMIC CONSIDERATIONS: This project has seismic design requirements as follows:

a. All components and, additionally, components requiring a manufacturer's Certificate of Compliance to prove "on line capability."

B. General Design Performance Requirements.

1. Seismic Certification and Analysis:

a. Calculations by the Manufacturer's Licensed Professional Engineer substantiating the mounting system, seismic or wind restraints and recommended anchor bolts shall be submitted for review along with the shop drawings. Seismic and wind loads shall have their calculations based on seismic loads and wind loads as specified herein. All analysis shall be stamped by the Licensed Professional Engineer having a PE from the same state as the project.

b. Unless otherwise specified, all equipment, piping and ductwork shall be restrained to resist seismic forces. Restraints shall maintain equipment, piping or ductwork in a captive position. Restraint devices shall be designed and selected to meet seismic requirements as defined in the latest issue of:

(i) New York State and Local Building Codes

c. In addition to all of the above provisions, all trades shall comply with NYS Building Code using, when available, vendors that comply with the provisions stated herein and submitting the special inspections listed within these specifications. Where compliance is not possible, each contractor shall submit a vendor report (form CVC-1) clearly indicating that none of the specified, listed or other vendors known to the contractors meet the compliance, testing and certification portions of the NYSBC. Special inspections of the component installation shall still be conducted, even if no vendors meet the following requirements. All non-isolated and isolated equipment (components) shall be secured to the structure in accordance with that code.

2. All component manufacturers will submit for approval the following as required below:

a. All MEP/FP components noted in this specification will have the manufacturer of that component submit the Approved Agency's Certificate of Compliance for the specific equipment. Analytical or Shaker Test certification through the component's load path including structure at its center of gravity shall include anchorage, structural and online capability. Use of historical data shall be permitted if evidence confirms historical based component having the same construction and weight with accompanying center of gravity as submitted unit and basis of historical claim conforms to loads derived in testing with accompanying accelerations based on AC-156.

b. In addition, all components of the facility will have the manufacturer of that component submit the Approved Agency's Certificate of Compliance for their equipment. Analytical of Shaker Test certification through the components load path to structure at its center of gravity shall include on line capability. Where components do not effect the facility's functional operation but could effect the performance of other components should they dislodge, only anchorage of that component requires compliance. Components needed for continued operation of the building require Analytical or Shaker Test certification through the total component's load path to structure calculated at is center of gravity. Certification shall prove, anchorage, structural and on line capability. For use of historical data, see a) above).

3. Design Seismic Loads:

a. Projects in the United States have a minimum design load of 0.4g for statically mounted components and 0.5g for resiliently mounted components. Actual loads for both internal or external isolation and/or anchorage of components shall be as above or as calculated for the specific project location but in no event shall it be less than the above.

b. Exclusions for seismic restraint of piping and duct shall be according to applicable codes. The minimum horizontal restraint capability shall be designed to survive a horizontal load of 0.9g and a vertical load of 0.6g.

c. Analysis for anchorage must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bold diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in this section, acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.
d. Vertical load shall be calculated at 1/3 the horizontal load.
e. Internally isolated equipment in lieu of specified isolation and restraint systems must meet all of the requirements of this section.
f. In the event that the equipment is internally isolated and restrained, the entire unit assembly must be seismically attached to the structure. Curb mounted equipment must not only have seismic attachment of the equipment but also to the curb. The attachment and certification thereof shall be by this section.
g. Failure is defined as the discontinuance of any attachment point or load path between component or structure. Permanent deformation is acceptable as long as the component continues to operate without failure and if permanent, it is within acceptable manufacturing or structural tolerances.

4. Additional Seismic Design Requirements for Fire Protection Components

a. Fire sprinkler piping system shall be braced meeting the minimum requirements of NFPA No. 13. Additionally, all branch lines will be braced.
b. All branch lines shall be end tied if not braced.
c. Standpipe risers shall be provided with a minimum of (1) flexible coupling (Victaulic Style 77 or equal) to accommodate lateral drift at each floor level.
d. Vertical pipe risers shall have their weight where possible supported above the center of gravity of the riser. Provide lateral guides at the top and bottom of the riser and at intermediate points not to exceed 30'.
e. Friction connections of any fire protection line to structure is not permissible under any circumstances. All connections must be positive.
f. Branch lines shall never act as a brace to mains.
g. All pipe sleeves either vertical or horizontal through walls or floors shall be designed to accommodate differential movement between the structure (floors as walls).

1.8 SPECIAL AND PERIODIC INSPECTION

A. Systems shall require Special Inspection and Periodic Special Inspection for seismic installation and anchorage during the course of construction, as defined by NYSBC.

1.9 CONTRACTOR RESPONSIBILITIES AND APPROVALS

A. Each contractor responsible for the installation of the components listed above shall be responsible for submitting a written contractor's Statement of Responsibility, (as outlined below) to the design team for their review. In addition all items requiring Special Inspection.

B. Identify the components that are part of the Quality Assurance Plan.

C. Identify all Special Inspection and Testing for components installed as part of this contract.

D. List control procedures within the contractor's organization for all special inspection and testing, including methods, frequency of reporting and their distribution of those reports.

E. List all personnel, including their qualifications, exercising control over the seismic aspects of the project.

F. Contractor Responsibilities

1. The Contractor performing the work on equipment and systems in this section of work shall have the following responsibilities.
2. As part of the work, this contractor shall engage the services of a NYS licensed professional engineer and shall have the following responsibilities.

    a. Select and coordinate the restraints and supports based on the final coordinated drawings showing exact location of all components and shall coordinate with the project structural engineer to ascertain that the connections to the structure will resist the seismic forces to which they might be subjected.
    b. Participate in the preparation of Coordination Drawings (as specified under another section of this work) to show space requirements for the seismic restraints and supports for the piping, ductwork and equipment.
    c. Be responsible for the performance of all special inspections as required by NYSBC, and all other agencies having jurisdiction.
    d. Identify the components that are part of the Quality Assurance Plan.
    e. Identify all Special inspection and Testing.
    f. List control procedures within the contractor's organization including methods and frequency of reporting and their distribution.
    g. List personnel and their qualifications exercising control over the seismic aspects of the project.

3. This work shall be coordinated with the vibration isolation requirements as specified under another section of the work.

4. Be responsible for the continuous inspections and periodic inspections as required by the IBC and all other agencies having jurisdiction.

5. Purchased and/or fabricated equipment must be designed to safely accept external forces of load in any direction for all rigidly and resiliently supported equipment, piping and ductwork without failure and permanent displacement of the equipment. Equipment must be capable of accepting external forces (as required by the specific design category for the project) in any direction without permanent displacement or failure of the equipment.

1.10 MANUFACTURER RESPONSIBILITIES

A. Note that the requirements for vibration control, vibration isolation and seismic restraint devices are specified under another section of this work.

B. In addition to the requirements specified under another section of this work, the manufacturer of vibration isolation and seismic restraint equipment shall have the following responsibilities. As part of their work, the manufacturer shall engage the services of a NYS licensed Professional Engineer, who shall have the following responsibilities.

1. Design the vibration isolation and seismic restraint requirements sizes and locations.

2. Provide piping and equipment isolation systems and seismic restraints as to meet the requirements as specified herein.

3. Guarantee specified isolation system deflection.

4. Provide installation instructions, drawings and field supervision to assure proper installation and performance.

5. Provide certification that the installation of all mounts and restraints meet the project requirements for seismic loading.

C. Substitution of internally isolated mechanical equipment in lieu of the specified isolation of this Section must be approved for individual equipment units and is acceptable only if required acceleration loads are certified in writing by the equipment manufacturer and stamped and sealed by a licensed Professional engineer.

D. All manufacturers providing equipment and/or vibration/seismic control systems must provide a Seismic Design Error and Omissions Insurance Certificate for their firm or their design consultant to certify their ability to provide engineering and design as required by this section.

E. All manufacturer's including Original Equipment Manufacturers (OEM) are responsible for Seismic Certification and Analysis.

1.11 MISCELLANEOUS

A. Housekeeping pads shall be sized to have a minimum of 6 inches (15 cm) of clearance all around the equipment or 12 bolt diameters, whichever is greater.

B. All components shall be positively attached to the building structure and be approved by the structural engineer. Positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double-sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection or any other equipment are not acceptable on this project as seismic bracing points.

C. Design Loads:

1. Actual loads shall be calculated but shall not be less than the minimum force and acceleration loads required for the specific category of the project for static mounted components including internal components as part of a manufactured system.

PART 2 - PRODUCTS

2.1 GENERAL

A. Vibration control, vibration isolators and seismic restraints are specified under another section of this work.

B. All vibration isolators and seismic restraints shall be the product of a single manufacturer. The basis of this specification is The VMC Group including Vibration Mountings & Controls, Amber/Booth or Korfund Dynamics.

2.2 INSPECTION

A. On completion of installation of all vibration isolation and seismic restraint devices herein specified, the local representative of the isolation materials manufacturer shall inspect the completed system and report in writing any installation errors, improperly selected isolation or restraint devices, or other faults that could affect the performance of the system. Contractor shall submit a report to the Architect, including the manufacturer's representative's final report, indicating all isolation reported as properly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

B. All special inspections on components required to be seismically restrained must be performed in accordance with NYSBC and as specified herein.

1. The professional engineer engaged by the contractor shall be responsible for the performance of all special inspection.

C. Continuous inspection: The full-time observation of work by an approved special inspector. The following pieces of equipment require these inspections:

1. All equipment using combustible energy sources.

2. All electric motors, transformers, and motor control centers.

3. Reciprocating and rotating type machinery.

4. Pipe, 3 inches & larger.

5. Tanks, heat exchangers & pressure vessels.

D. Periodic inspection: intermittent observation of work by an approved special inspector of the following pieces of equipment in compliance with IBC section 1704.

1. All smoke control systems during construction & prior to concealment for leakage testing.

2. All smoke control systems prior to occupancy for pressure differential testing.

3. Isolator units for seismic isolation system.

4. All flammable, combustible piping and their associated mechanical systems.

2.3 VIBRATION ISOLATION TYPES

A. Note that vibration isolation devices are included herein for coordination purposes only.

B. Type A: Spring Isolator – Free Standing VMC: A*C AB: SW

1. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded elastomeric cup or ¼" elastomeric acoustical friction pad between the bottom of isolator and the support.

2. All mountings shall have leveling bolts that must be rigidly bolted to the equipment.

3. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load.

4. Springs shall have a minimum additional travel to solid equal to 50% of the operating deflection.

5. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.

C. Type B: Seismically Restrained Spring Isolator VMC: AWRS, ASCM AB: CT, SWSR

1. Restrained spring mountings shall have a Type A spring isolator within a rigid housing that includes vertical limit stops to prevent spring extension with weight is removed. The housing shall serve as blocking during erection. A minimum clearance of ¼" shall be maintained around restraining bolts and internal elastomeric deceleration bushings so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings may be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces.

D. Type C: Combination Spring/Elastomer Hanger Isolator (30° Type) VMC: RSH30 AB: BRSA

1. Hangers shall consist of rigid steel frames containing minimum 1¼" thick elastomeric elements at the top and a steel spring with general characteristics as in Type A. The DuruleneTM element shall have resilient bushings projecting through the steel box.

2. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the rod bushing and short circuiting the spring.

3. Submittals shall include a hanger-drawing showing the 30° capability.

4. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be type pre-compressed or pre-positioning for all manufacturers.

E. Type D: Elastomer Double Deflection Hanger Isolator VMC: RHD AB: HRD/BRB

1. Molded (minimum 1 ¼" thick) DuruleneTM element with projecting bushing lining the rod clearance hole. Static deflection at rated load shall be a minimum of 0.35".

2. Steel retainer box encasing elastomeric mounting capable of supporting equipment up to four times the rated capacity of the element.

F. Type E: Combination Spring/Elastomer Hanger Isolator VMC: RSH AB: BSR

1. Spring and DuruleneTM elements in a steel retainer box with the features as described for Type C and D isolators.

2. Hanger locations requiring pre-compression for holding piping at fixed elevation shall be type pre-compressed or pre-positioning for all manufacturers.

3. 30° angularity feature is not required.

G. Type F: Seismically Restrained Elastomer Floor Isolator VMC: RSM, MB AB: RSM

1. Bridge-bearing elastomeric mountings shall have a minimum static deflection of 0.2" and all directional seismic capability. The mount shall consist of a ductile iron or aluminum casting containing two separated and opposing molded elastomeric elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock-absorbing elastomeric materials shall be compounded to bridge-bearing specification.

H. Type G: Pad Type Elastomer Isolator (Standard) VMC: Maxiflex AB: Maxiflex

1. One layer of ¾" thick elastomeric pad consisting of 2" square modules for size required.

2. Load distribution plates shall be used as required.

3. Bolting required for seismic compliance. Elastomeric and duck washers and bushings shall be provided to prevent short-circuiting.

I. Type H: Pad Type Elastomer Isolator (High Density) VMC: Fabriflex AB: NDB

1. Laminated canvas duck & neoprene, maximum loading 1000 psi, minimum ½" thick.

2. Load distribution plate shall be used as required.

3. Bolting required for seismic compliance. Elastomeric and duck washers and bushings shall be provided to prevent short-circuiting.

J. Type I: Thrust Restraints VMC: RSHTR AB: TRK

1. A spring element similar to Type A isolator shall be combined with steel angles, backup plates, threaded rod, washers and nuts to produce a pair of devices capable of limiting movement of air handling equipment to ¼". Hardware may be supplied by contractor.

2. Restraint shall be easily converted in the field from compression type to tension type.

3. Thrust restraints shall be installed on all cabinet fan heads, axial or centrifugal fans whose thrust exceeds 10% of unit weight.

K. Type J: Pipe Anchors VMC: MDPA AB: AB/AG

1. All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum ½" thick 60 durometer elastomer.

2. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction.

3. Allowable loads on the isolation material should not exceed 500 psi and the design shall be balanced for equal resistance in any direction.

L. Type K: Pipe Guides VMC: PG AB: PG

1. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum ½" thickness of 60-durometer elastomer.

2. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and re-insertable to allow for selection of pipe movement.

3. Guides shall be capable of ± 1 5/8" motion, or to meet location requirements.

M. Type L: Isolated Pipe Hanger System VMC: CIH, CIR, TIH, PIH AB: CIH, CIR, TIH, PIH

1. Pre-compressed spring and elastomer isolation hanger combined with pipe support into one assembly. Replaces standard clevis, single or double rod roller, or double rod fixed support.

2. Spring element (same as Type A) with steel lower spring retainer and an upper elastomer retainer cup with an integral bushing to insulate support rod from the isolation hanger.

3. The elastomeric element under the lower steel spring retainer shall have an integral bushing to insulate the support rod from the steel spring retainer.

4. Hangers shall be designed and constructed to support loads over three times the rated load without failure.

5. Systems shall be pre-compressed to allow for rod insertion and standard leveling.

2.4 SEISMIC RESTRAINT TYPES

A. Type I: Spring Isolator, Restrained VMC: ASCM, AWRS AB: CT, SWSR

1. Refer to vibration isolation Type B.

B. Type II: Seismically Restrained Elastomer Floor Isolator VMC: RSM AB: RSM

1. Refer to vibration isolation Type F.

C. Type III: All Directional Seismic Snubber VMC: SR AB: ER

1. All-directional seismic snubbers shall consist of interlocking steel members restrained by an elastomeric bushing of DuruleneTM. Bushing shall be replaceable and a minimum of ¼" thick. Rated loading shall not exceed 1000 psi. A minimum air gap of 1/8" shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Elastomeric bushings shall be rotated to insure no short circuits exist before systems are activated.

D. Type IV: Floor or Roof Anchorage VMC: Cast-In Plates AB: FA

1. Rigid attachment to structure utilizing wedge type anchor bolts, anchored plates machine screw, bolting or welding. Power shots are unacceptable.

E. Type V: Seismic Cable Restraints VMC: SCR AB: ERS

1. Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Single arm braces with resilient bushings can be substituted for seismic cable restraints.

F. Type VI: Rigid Arm Brace VMC: SAB AB: SAB

1. Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minim um safety factor of two and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment spaced to ICBO standards for attachment to concrete.

G. Type VII: Internal Clevis Cross Brace VMC: ICB AB: SAB

1. Internal clevis cross braces at seismic locations shall be pre-cut pipe sized for internal dimensions.

H. Type VIII: Seismic Waterproof Foundation Wall Sleeve VMC: SWFWS AB: SWFWS

1. Seismic waterproof foundation wall sleeves shall consist of two elastomeric sleeves that shall be mounted both inside and out of the vertical foundation wall. The conical design shall have a suitably waterproof means of fastening to both concrete and to its concentric utility pipe. Allowable vertical drift shall be plus or minus 2" from the installed neutral point along the vertical "y" axis. All fittings shall be stainless steel or galvanized.

2.5 EQUIPMENT BASES

A. General

1. All curbs and roof rails are to be bolted or welded to the building steel or anchored to the concrete deck (minimum thickness shall be 4") for resisting wind and seismic load forces in accordance with the project location. (Fastening to metal deck is unacceptable)

B. Base Types

1. Type B-1: Integral Structural Steel Base VMC: WFB AB: SFB/WSB

a. Rectangular bases are preferred for all equipment.
b. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case and end suction pumps shall include supports for suction and discharge elbows.
c. All perimeter members shall be structural steel beams with a minimum depth equal to 1/12 of the longest dimension of the base.
d. Base depth need not exceed 12" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.
e. Height saving brackets shall be employed in all mounting locations to provide a minimum base clearance of 2".

C. Type B-2: Concrete Inertia Base VMC: MPF/WPF AB: CPF

a. Vibration isolation manufacturer shall furnish rectangular welded or bolted modular steel concrete pouring forms for floating and inertia foundations.
b. Bases for split case and end suction pumps shall be large enough to provide for suction and discharge elbows.
c. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6".
d. The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity.
e. Forms shall include a minimum concrete reinforcing consisting of ½" bars welded in place a maximum of 12" on centers running both ways in a layer 1 ½" above the bottom.
f. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured.
g. Height saving brackets shall be employed in all mounting locations to maintain a 2" minimum clearance below the base.

2. Type B-3: Seismic Isolation Curb VMC: P6200/P6300 AB: RTIC

   a. Option: Sound Package 1 & 2 VMC/AB-RPFMA/SRPFMA

   b. Curb mounted rooftop equipment shown on isolation schedule shall be mounted on structural seismic spring isolation curbs. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. The lower frame must accept point support for both seismic attachment and leveling. The upper frame must be designed with positive fastening provisions (welding or bolting), to anchor the roof top unit to the curb, which will not violate the National Roofing Contractor's Association (NRCA) ratings of the membrane waterproofing. Sheet metal screws are only acceptable if all provisions in Section 1.4, Article B, 5h, Design Seismic Loads, are met. Contact points between the roof top unit, the curb and the building's structure shall show load path through those locations only.
   c. All directional elastomeric snubber bushings shall be minimum of ¼" thick. Steel springs shall be laterally stable and rest on ¼" thick elastomeric acoustical pads.
   d. Hardware must be plated and the springs shall be powder coated or cadmium plated.
   e. The curb's waterproofing shall be designed to meet all NRCA requirements.
   f. All spring locations shall have access ports with removable waterproof covers and all isolators shall be adjustable, removable and interchangeable.
   g. Isolated curbs shall be supplied with a continuous air seal between the upper floating member and the stationary wood nailer.
   h. Option #1Where sound barrier package is required, curb shall have full size lay in attenuation panels having a minimum STC rating of 60 when combined with the roof deck's rating. Attenuation system shall add a full sound attenuation structural floor to the curb capable of spanning the curb's width and designed for live loads of 20 psf. Panels shall not weigh more than 6 psf. The 4" nominal galvanized panel shall be joined to allow for airtight construction and additionally shall have a support system where the panels are used below an outside condenser section. Panels shall be waterproof for both outdoor and indoor application. The space blow the curb panels and the roof deck shall have 4" of insulation contractor furnished and installed.

      (i) Curb wall construction shall utilize the roofer's standard insulation where curbs use the TAS open thermal acoustical screening system. Solid wall curbs shall use 2" of the factory ductliner installed by the curb manufacturer. The entire curb shall have a continuous neoprene elastomeric air seal. Type RPFMA shall use an open return system with the roof return opening set as far as possible from the unit's return opening.

i. Option # 2 When curb type SRPFMA (Supply Return Plenum Construction) is required, in addition to Option # 1 the walls of the supply section will use 2" sound attenuating panels as well as a continuous inner elastomeric air seal and isolated plenum divider. Both supply and return ducts shall seal directly to curb base floor attenuation panels.

3. Type B-4: Seismic Non-Isolated Curbs VMC: P6000 AB: RTC

a. Option: Sound Package VMC-RPFMA/SRPFMA System
b. Seismic curbs shall have all provisions as Type B-3 curbs with the exception of spring isolation.
c. System shall be designed for positive anchorage or welding of equipment to supports and welding of supports to the building steel.

4. Type B-5: Isolated Equipment Supports VMC: R7200/R7300 AB: R7200/R7300

a. Continuous structural equipment support rails that combine equipment support and isolation mounting into one unitized roof flashed assembly with all features as described for Type B-3.
b. System shall be designed for positive anchorage or welding of equipment to supports and welding of supports to the building steel.

5. Type B-6: Non-Isolated Equipment Supports VMC: R7000 AB: R7000

a. This shall have the same provisions as Type B-5 without the spring isolation.

2.6 FLEXIBLE CONNECTORS

A. Type FC-2: Flexible Stainless Steel Hose VMC: BS AB: SSFP/SSPM

1. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples.

B. Type BC-2 connector shall be braided bronze for freon connections.

1. Minimum lengths shall be as tabulated:

| | Flanged | Male Nipples | |
|---|---|---|---|
| a. | | | |
| b. | 3 x 14 10 x 26 | ½ x 9 | 1 ½ x 13 |
| c. | 4 x 15 12 x 28 | ¾ x 10 | 2 x 14 |
| d. | 5 x 19 14 x 30 | 1 x 11 | 2 ½ x 18 |
| e. | 6 x 20 16 x 32 | 1 ¼ x 12 | 8 x 22 |

2. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. All areas that will receive components requiring vibration control, seismic or wind load bracing shall be thoroughly examined for deficiencies that will affect their installation or performance. Such deficiencies shall be corrected prior to the installation of any such system.

B. Examine all "rough ins" including anchors and reinforcing prior to placement.

3.2 COMPONENT INSTALLATION, (General)

A. All vibration isolators and seismic, wind restraint systems must be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic, wind restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system specified herein.

D. The contractor shall not install any isolated equipment, piping or duct, which makes rigid connections with the building unless isolation is not specified."Building" includes, but is not limited to, slabs, beam, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Over stressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. General bracing may occur from flanges of structural beams, upper truss cords in bar joist construction and cast in place inserts or wedge type drill-in concrete anchors.

G. Seismic cable restraints shall be installed slightly slack to avoid short-circuiting the isolated suspended equipment or piping.

H. Seismic cable assemblies are installed taut on non-isolated systems. Seismic single arm braces may be used in place of cables on rigidly attached systems but can also be used on isolated systems when incorporating resilient bushings.

I. At locations where seismic cable restraints or seismic single arm braces are located, the support rods must be braced when necessary to accept compressive loads. See Table "E."

J. At all locations where seismic cable braces and seismic cable restraints are attached to the pipe clevis, the clevis bolt must be reinforced with pipe clevis cross bolt braces or double inside nuts if required by seismic acceleration levels.

K. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted.

L. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraints shall be those described in the specification when horizontal motion exceeds 3/8."

M. Special and Periodic Inspections for items listed in Section 1.4, Article B shall be conducted and submitted on a timely basis.

3.3 EQUIPMENT INSTALLATION

A. Equipment shall be isolated and/or restrained as per Tables A-E at the end of this section.

B. Place floor mounted equipment on 4" high concrete housekeeping pads properly sized and doweled or expansion shielded to the deck to meet acceleration criteria (see Section 1.4). Anchor isolators and/or bases to housekeeping pads. Concrete work is specified under that section of the contract documents.

C. Additional Requirements

1. The minimum operating clearance under all isolated components bases shall be 2."

2. All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment, isolators and restraints.

3. The equipment shall be installed on blocks to the operating height of the isolators. After the entire installation is complete and under full load including water, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. Remove all debris from beneath the equipment and verify that there are no short circuits of the isolation. The equipment shall be free to move in all directions, within the limits of the restraints.

4. Ceilings containing diffusers or lighting fixtures must meet seismic requirements by using earthquake clips of other approved means of positive attachment to secure diffuser and fixtures to structure.

5. All floor or wall-mounted equipment and tanks shall be restrained with Type V restraints.

3.4 PIPING AND DUCTWORK ISOLATION

A. Vibration Isolation of Piping

1. HVAC Water Piping: All spring type isolation hangers shall be precompressed if isolators are installed prior to fluid charge. If installed afterwards, field pre-compressed isolators can be used. All HVAC piping in the machine room shall be isolated as well as pressurized runs in other locations of the building 6" and larger. Horizontal pressurized runs in all other locations of the building shall be isolated by Type E hangers.

Floor supported piping shall rest on Type Bisolators. Heat exchangers and expansion tanks are considered part of the piping run. The first 3 isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces, the first3 hangers shall have 0.75" deflection for pipe sizes up to and including3", 1 3/8" deflection for pipe sizes thereafter. Where column spacing exceeds 35', isolation hanger deflection shall be 2 ½" for pipes exceeding 3" diameter. Type L hangers maybe substituted for the above where isolation hangers are required.

2. Steam and Condensate Piping: All ceiling suspended piping in the mechanical equipment room shall be isolated with Type D hangers. All floor supported piping shall be supported with Type F isolators.

3. Plumbing Water Lines. Plumbing water lines in the machine room shall only be isolated if connected to isolated equipment. (See Table B.)Isolator type shall be as listed in Article 1, above.

4. Riser Location: All risers shall be supported on Type J or K anchors or guide restraints positively attached to both the riser and structure. Spiders welded to the pipe can substitute for Type K guides using J Type anchors.

5. Gas lines shall not be isolated.

6. Fire protection lines shall not be isolated.

B. Seismic Restraint of Piping, Conduit, Bus Duct and Cable Tray

1. All high hazard and life safety pipe regardless of size such as fuel oil piping, fire protection mains, gas piping, medical gas piping and compressed air piping shall be seismically restrained or braced. Type V seismic cables restraints or resilient single arm braces shall be used if piping is isolated. Type V seismic cable restraints of Type VI single arm braces may be used on non-isolated piping. There are no exclusions for size or distance in this category.

2. Seismically restrain piping located in boiler rooms, mechanical equipment rooms and refrigeration equipment rooms that is 1 ¼" I.D. and larger. Type V seismic cables restraints or resilient single arm braces shall be used if piping is isolated. Type V seismic cable restraints or Type VI single arm braces may be used on unisolated piping.

3. Seismically restrain all other piping 2 ½" diameter and larger. Type V seismic cables restraints or resilient single arm braces shall be used if piping is isolated. Type VI seismic cable restraints or single arm braces may be used on unisolated piping.

4. See Table D for maximum seismic bracing distances.

5. Multiple runs of pipe on the same support shall have distance determined by calculation.

6. Rod braces shall be used for all rod lengths as listed in table "E."

7. Clevis hangers shall have braces placed inside of hanger at seismic brace locations.

8. Where thermal expansion is a consideration, guides and anchors maybe used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion of contraction.

9. Transverse restraint for one pipe section may also act as longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.

10. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints. Use Type V or VI restraint, if trapeze is smaller than 48" long.

11. Branch lines may not be used to restrain main lines.

12. All fire protection branch lines shall be end tied.

13. Where pipe passes through a two-sided sheetrock wall, the wall, if tight to the pipe, shall act as a lateral/transverse brace for pipe sizes up to and including 4", provided hole is reinforced with metal corner bead.

14. Where horizontal pipe crosses a building's drift expansion joint, allowance shall be part of the design to accommodate differential motion.

15. Vertical pipe rises between floors shall have their differential movement part of the seismic design for building drift.

16. For horizontal passage of all underground utilities through building's foundation wall, all pipe shall pass freely through an oversized opening and waterproofed accordingly to accommodate maximum allowable building drift. (Seismic Restraint Type VIII).

C. Vibration Isolation of Ductwork

1. All discharge runs for a distance of 50' from the connected equipment shall be isolated from the building structure by means of Type E combination spring elastomer hanger or Type A floor spring isolators. Spring deflection shall be a minimum of 0.75".

2. All duct runs having air velocity of 1500 feet per minute (fpm) or more shall be isolated from the building structure by Type E combination spring elastomer hangers or Type A floor spring supports. Spring deflection shall be a minimum of 0.75"

D. Seismic Restraint of Ductwork

1. Restrain rectangular ductwork with cross sectional area of 6 square feet or larger. Type V seismic cable restraints or Type VI single arm braces shall be used on this duct. Duct which serves a life safety function or carries toxic materials in an "Essential or High Hazard Facility" must be braced with no exceptions regardless of size or distance requirements.

2. Restrain round ducts with diameter's of 28" or larger. Type V seismic cable restraints or Type VI single arm braces.

3. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.

4. See Table D for maximum seismic bracing distances.

5. Duct must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze. Additional reinforcing is not required if duct sections are mechanically fastened together with frame bolts and positively fastened to the duct support suspension system.

6. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.

7. Walls, including gypsum board non-bearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.

8. If ducts are supported by angles, channels or strut, duct shall be fastened to same at seismic brace locations in lieu of duct reinforcement.

3.5 FIELD QUALITY CONTROL, INSPECTION

A. All Independent Special and Periodic Inspections must be performed and submitted on components as outlined in Section 1.4 B, Article 4. (See also contractor Responsibility, Section 1.4B, Article 5). Note: Special Inspection services are to be supplied by the owner.

B. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the completed project and certify in writing to the Contractor that all systems are installed properly, or require correction. The Contractor shall submit a report to the Architect, including the representative's report, certifying correctness of the installation or detailing corrective work to be done.

| TABLE "A"<br>HVAC EQUIPMENT | | | | | | |
|---|---|---|---|---|---|---|
| ABOVE GRADE | | | | | | |
| EQUIPMENT (See Note!) | | MTNG | ISOL | DEFL (in.) | BASE | RESTR |
| Dry Coolers Condensers/ Condensing Outdoor Units | | Roof | B | 2.50 (minimum) | B-5 | IV |
| Axial Fans (Inline Type) | | Flr | B | See Guide | -- | IV |
| | | Clg | E | See Guide | -- | V |
| Base Mounted Pumps | To 15 HP | Flr | B | 0.75 | B-2 | IV |
| | >15 HP | Flr | B | 1.50 | B-2 | IV |
| Cabinet Fans & Packaged AHU Indoor | To 1 HP | Flr | B | 0.75 | -- | IV |
| | | Clg | E | 0.75 | -- | V |
| | >1 HP | Flr | B | See Guide | --- | IV |
| | | Clg | E | See Guide | -- | V |
| Centrif. Fans Arr. 1& 3 | Class 1 | Flr | B | See Guide | B-1 | IV |
| | Class 2 & 3 | Flr | B | See Guide | B-2 | IV |
| Centrif. Fans (VentSets) Arr. 9 & 10 | Class 1 | Flr | B | See Guide | See | IV |
| | Class 2 & 3 | Clg | E | See Guide | B-2 | V |
| Computer Room Units | | Flr | B | 1.5 | B-7 | IV |
| Condensate Pumps | | Flr | F | 0.20 | If req. | IV |

| TABLE "A"<br>HVAC EQUIPMENT | | | | | | |
|---|---|---|---|---|---|---|
| ABOVE GRADE | | | | | | |
| EQUIPMENT (See Note!) | | MTNG | ISOL | DEFL (in.) | BASE | RESTR |
| Curb Mtd. Equip. (Non-Isol.) | | Roof | -- | -- | B-6 | IV |
| Fan Coil Units | | Flr | B | 0.75 | -- | IV |
| | | Clg | E | 0.75 | -- | V |
| Unit/Cab Heaters | | Clg | D | 0.30 | -- | V |

1. Minimum Deflection Guide for Table "A"

| Units Lowest R.P.M. | DEFLECTION |
|---|---|
| Less than 400 | 3.50" |
| 401 to 600 | 2.50" |
| 601 to 900 | 1.50" |
| OVER 900 | 0.75" |

NOTES FOR TABLES A, B, & C: GENERAL:
ISOL= ISOLATOR
DEFL= DEFLECTION
RESTR = SEISMIC RESTRAINT
MTNG= MOUNTING
ALL DEFLECTIONS INDICATED ARE IN INCHES.

Note 1: For equipment with variable speed driven components having driven operating speed below 600 rpm, select isolation deflection from minimum deflection guide

Note 2: For roof applications, use base Type B-5.

Note 3: Units may not be capable of point support. Refer to separate air handling unit specification section. If base is not provided by that section and external isolation is required, provide Type B-1 base by this section for entire unit.

Note 4: Static deflection shall be determined based on the deflection guide for Table "A".

Note 5: Deflections indicated are minimums at actual load and shall be selected for manufacturer's nominal 5", 4", 3" 2" and 1" deflection spring series, RPM is defined as the lowest operating speed of the equipment.

Note 6: Floor mounted fans, substitute base Type B-2 for class 2 or 3 or any fan having static pressure over 5".

Note 7: Indoor utility sets with wheel diameters less than 24" need not have deflections greater than .75".

Note 8: Curb mounted fans with curb area less then 9 square feet are excluded.

Note 9: For equipment with multiple motors, Horse Power classification applies to largest single motor.

TABLE B

PLUMBING EQUIPMENT

| EQUIPMENT | HP | MTNG | BASE | RESTR | ISOL | DEFL (in.) | BASE | RESTR |
|---|---|---|---|---|---|---|---|---|
| Air Compressors & VacuumPumps | to 10 >10 | Flr | --- | IV | B | 0.75 | --- | IV |
| | | Flr | B-2 | V | E | 1.50 | B-2 | V |
| Base Mounted Pumps | to 15 >15 | Flr | B-2 | IV | B | 0.75 | B-2 | IV |
| | | Flr | B-2 | IV | B | 1.50 | B-2 | IV |

TABLE C

VIBRATION ISOLATION & SEISMIC RESTRAINTREQUIREMENTS FOR ELECTRICAL EQUIPMENT INSTALLATION ATTACHMENT POINT

| | | | ON GRADE | | | | ABOVE GRADE | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| EQUIPMENT | SIZE | MTNG | ISOL | DEFL | BASE | RESTR | ISOL | DEFL | BASE | RESTR |
| TRANSFORMER Dry type | ALL | Flr | - | - | - | IV | D | 0.30 | | IV |
| | | CEILING | - | - | - | V | E | 0.20 | | V |

**where component cannot be point supported base type B-1 shall be used.*

| TABLE D<br>SEISMIC BRACING TABLE<br>(Maximum Spacing Shown- Actual Spacing to Be Determined by Calculation) | | | |
|---|---|---|---|
| EQUIPMENT | ON CENTERTRANSVERSE | ON CENTERLONGITUDINAL | CHANGE OF DIRECTION |
| DUCT | 30 FEET | 60 FEET | 4 FEET |
| PIPE THREADED, WELDED, SOLDERED OR GROOVED | | | |
| TO 16” | 40 FEET | 80 FEET | 4 FEET |
| 18” – 28” | 30 FEET | 60 FEET | 4 FEET |
| 30” – 40” | 20 FEET | 60 FEET | 4 FEET |
| 42” & LARGER | 10 FEET | 30 FEET | 4 FEET |
| *PIPE - NO HUB OR BELL AND SPIGOT* | | | |
| 2.5” & LARGER | 10 FEET | 20 FEET | 4 FEET |
| CONDUIT | 40 FEET | 80 FEET | 4 FEET |
| CABLE TRAY | 40 FEET | 80 FEET | 4 FEET |

| TABLE E<br>SEISMIC ROD BRACING SCHEDULE OF VERTICAL HANGER ROD | | | | | |
|---|---|---|---|---|---|
| VMC ROD BRACING CLAMP NO. | ROD DIA (INCHES) | ROD LENGTHS OVER “X”INCHES | STEEL ANGLE SIZE INCHES | CLAMP SPACING | MIN # OF CLAMPS PER STIFFENER |
| SRBC – 1 ½ | ¾" | 37" | 1 ½ x 1 ½ x ¼" | 16" | 3 |
| SRBC – 1 ½ | 7/8" | 43" | 1 ½ x 1 ½ x ¼" | 12" | 4 |
| SRBC – 1 ½ | 1" | 50" | 1 ½ x 1 ½ x ¼" | 16" | 4 |
| SRBC – 1 ½ | 1 1/8" | 62" | 1 ½ x 1 ½ x ¼" | 20" | 4 |

C. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturer’s written instructions and all certified submittal data.

D. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

E. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system specified, under another section of the work.

F. The contractor shall not install any isolated equipment, piping or duct, which makes rigid connections with the building. “Building” includes, but is not limited to, slabs, beams, columns, studs and walls.

G. Coordinate work with other trades to avoid rigid contact with the building.

H. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted.

I. Where piping passes through walls, floors or ceilings, the contractor shall provide wall seals or resilient packed pipe sleeves.

J. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraints shall be those described in the specification when horizontal motion exceeds 3/8 inches.

K. Special and Periodic Inspections shall be conducted and submitted on a timely basis.

3.6 EQUIPMENT RESTRAINTS

A. Equipment shall be isolated and restrained.

B. Place floor mounted on 4 inches (10 cm) high concrete housekeeping pads properly doweled or expansion shielded to the deck to meet acceleration criteria. Anchor isolators and/or bases to housekeeping pads.

C. Ceilings containing diffusers must meet seismic zone requirements by using earthquake clips or other approved means of positive attachment to secure diffuser to T-bar structure.

D. Additional Requirements

1. The minimum operating clearance under all isolated components bases shall be 2 inches (5 cm).

2. All floor or wall mounted equipment and tanks shall be restrained.

3.7 PIPING AND DUCTWORK RESTRAINTS

A. Seismic Restraint of Piping.

1. Seismically restrain all piping.

2. Multiple runs of pipe on the same support shall have distance determined by calculation.

3. Rod braces shall be used for all rod lengths greater than 3 inches (7 cm).

4. Clevis hangers shall have spacers placed inside of hanger at seismic brace locations.

5. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.

6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24 inches (61 cm) of the elbow or TEE or combined stresses are within allowable limits at longer distances.

7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints.

8. Branch lines may not be used to restrain main lines.

END OF SECTION 23 00 01

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# SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:

1. Design Criteria.
2. Referenced Standards.
3. Submittals.
4. Coordination drawings.
5. Record documents.
6. Maintenance manuals.
7. Codes, Permits and Inspections.
8. Separation of Work Between Trades.
9. Definitions and Interpretations.
10. Interpretation of the drawings and specification
11. Seismic Design
12. Delivery, Storage and Handling
13. Operating Instructions
14. Guarantees and Certifications
15. Rough-In
16. Mechanical Installations
17. Cutting and Patching
18. Site Visitation Surveys and Measurements
19. Removals and Alterations
20. Connections to existing work
21. Preconstruction Testing - Existing system

22. Existing Systems Design

23. Refrigerant Handling

1.2 DESIGN CRITERIA

A. Outdoor Design Conditions

1. Summer: 89°F (d.b.) / 73°F (w.b.)

2. Winter: (13°F)

B. Indoor Design Conditions

1. Summer:

a. Occupied Spaces (Offices, etc.):

(i) Temperature: 75°F + 2°F (occupied); 80°F + 2°F (unoccupied)
(ii) Relative Humidity: 50% - 55% RH

b. Unconditioned Spaces (mechanical and electric rooms)

(i) Temperature: mechanical ventilation thermostatically controlled to obtain 10°F above ambient temperature
(ii) Relative Humidity: not controlled

2. Winter

a. Occupied Spaces:

(i) Temperature: 68°F + 2°F (occupied); 65°F + 2°F (unoccupied)
(ii) Relative Humidity:- no humidification is included in the project.

b. Unconditioned Spaces (mechanical rooms)

(i) Temperature: 64°F + 2°F (winter), 100°F + 2°F (summer)
(ii) Relative Humidity: no humidification is included in this project.

C. Relative Pressurization Criteria

1. Overall building pressurization will be positive in relation to the outdoors

2. Bathrooms and janitor's closets will be negative in relation to the corridors

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this and the other sections of Division 23.

B. Section 23 00 01 - “Seismic, Wind and Flood Load Design”.

C. Section 23 05 50 - "Basic Mechanical Materials and Methods".

D. This section is a part of each Division 23 Section.

1.4 REFERENCE STANDARDS: The reference standards listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

A. Air-Conditioning Heating and Refrigeration Institute (AHRI):

B. American National Standard Institute (ANSI):

C. American Movement and Control Association International, Inc. (AMCA):

D. American Society of Mechanical Engineers (ASME):

E. American Society for Testing and Materials (ASTM):

F. National Fire Protection Association (NFPA):

G. Associated Air Balance Council (AABC).

H. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).

I. American Welding Society (AWS)

J. Cooling Technology Institute (CTI).

K. Environmental Protection Agency (EPA).

L. National Environmental Balancing Bureau (NEBB).

M. National Electrical Code (NEC)

N. Occupational Safety and Health Administration (OSHA).

O. Underwriters Laboratories (UL).

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and as specified in Division 01 Section "SUBMITTALS."

B. Prior to purchasing any equipment or materials, a list of their manufacturers shall be submitted for review.

C. Prior to assembling or installing the work, the following shall be submitted for review:

1. Scale drawings indicating insert and sleeve locations.

2. Scale drawings showing all piping and duct runs with sizes, elevations and appropriate indication of coordination with other trades. This submission to us shall consist of an electronic submittal and 2 paper prints.

3. Catalog information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment.

4. Coordination drawings for access panel and door locations.

5. Shop drawings detailing fabrication and installation for supports for mechanical materials and equipment.

6. Mechanical Contractor shall submit complete AC unit sheet metal and piping shop drawings to the AC unit manufacturer prior to submission to the Engineer. The AC unit manufacturer shall approve the air performance and acoustical performance of the AC units in the location and with the ductwork and piping configuration and construction as indicated on the shop drawing. AC unit manufacturer shall indicate approval directly on the shop drawing.

7. Welder Certificates signed by Contractor certifying that welders comply with requirements specified under “Quality Assurance” in Section 25 05 50.

8. Delivery, Storage, and Handling

    a. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
    b. Unit shall be stored and handled in accordance with manufacturer's instructions.
    c. Unit shall be shipped with all listed items and control wiring factory installed unless noted on the submittals and approved prior to shipment.
    d. Unit shall be shipped complete as specified. Parts for field installation shall not be shipped and stored on site without prior approval.
    e. Rigging: Units shall be fully assembled. Units requiring disassembly for rigging shall be factory assembled and tested. Disassembly, reassembly and testing shall be supervised by the manufacturer's representative.
    f. Unit shall be shipped with firmly attached labels that indicate name of manufacturer, model number, serial number, and plan tagging.
    g. The Vendor shall shrink-wrap all electronic equipment and spare parts prior to shipping. Spare parts are to be delivered at time of owner acceptance.

9. Preconstruction Conference Prior to Start of Work

    a. Prior to commencing any Work, the CM, together with designated major Contractors, shall confer with the Architect and Engineer concerning the Work under the Construction Contract.
    b. The pre-construction conference will be conducted under the leadership of the CM and will occur soon after the CM notifies the Subcontractors of contract award. The pre-construction conference will focus on items such as the expedited submittal review procedure, interface and coordination between Contractor work scope, the CM's project site rules and requirements, temporary utility requirements, CM's construction schedule, etc.

D. Documents will not be accepted for review unless:

1. They include complete information pertaining to appurtenances and accessories.

2. They are submitted as a package where they pertain to related items.

3. They are properly marked with service or function, project name, where they consist of catalog sheets displaying other items which are not applicable.

4. They indicate the project name and address along with the Contractor's name, address and phone number.

5. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

E. Shop Drawing Review

1. The purpose of the review of shop drawings is to maintain integrity of the design. Unless the contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, review by the Engineer or Architect does not constitute acceptance. It is not to be assumed that the engineer has read the text nor reviewed the technical data of a manufactured item and its components including where the Vendor has pointed out differences between his product and the specified model.

2. It is the responsibility of the contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by him with other trades. Review of shop drawings containing errors does not relieve the contractor from making corrections at his expense.

3. Substitutions of equipment, systems, materials, temperature controls must be coordinated by the Contractor with his own or other trades which may be involved with the item, such as, but not limited to, equipment substitutions which change electrical requirements, or hanging or support weights or dimensions.

4. Any extra changes or credits which may be generated by other trades due to substitutions will not be accepted unless the Contractor has an agreement in writing with the Owner.

5. Proposed substitutions shall be in accordance with the requirements of the section governing substitutions. Substitutions of equipment, systems, etc. requiring approval of local authorities must comply with such regulations and be filed at the expense of the Contractor (should filing be necessary). Substitutions are subject to approval or disapproval by the Engineer. The contractor in offering substitutions shall hold the Owner and Engineer harmless if the substituted item is an infringement of patent held by the specified item.

F. Explanation of Shop Drawing Stamp

1. Reviewed - No Exception Taken: indicates that we have not found any reason why this item should not be acceptable within the intent of the contract documents.

2. Exception Taken As Noted: indicates that we have found questionable components which if corrected or otherwise explained make the product acceptable.

3. Revised and Resubmit: indicates that this item should be resubmitted for review before further processing.

4. Resubmit Specified Item: indicates that the item will not meet the intent of the Contract.

5. Incomplete - Resubmit: Indicates that the submission is not complete and ready for review by the Architect or Engineer.

6. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for Construction, the Contractor scheduling his own work, or the Owner.

7. The Contractor is responsible for having "Reviewed" copies of shop drawings bearing the Reviewed - No Exception Taken stamp of the Architect/Engineer or Owner's Consultant are kept on the job site and work is implemented in the field in accordance with these documents.

8. Where information from one Contractor is required by another contractor, it is the responsibility of the contractors to exchange information and coordinate their work.

1.6 COORDINATION DRAWINGS

A. Prepare coordination drawings in accordance with Division 01 Section "PROJECT COORDINATION," and in accordance with Section HVAC trade coordination drawings to a scale of 3/8"=1'-0" or larger; detailing major elements, equipment components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

1. The coordination drawings shall be produced using AutoCad 2000 or later software. The design drawings will be made available on disks in AutoCad format for use as a basis for the "Coordination" drawings. These documents remain the property of Cosentini Associates and shall be used for no other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings.

2. Indicate the proposed locations of piping, ductwork, equipment, and materials. Include the following:

a. Planned piping layout, including valve and specialty locations and valve stem movement.
b. Planned duct system layout, including elbow radii and duct accessories.
c. Clearances for seismic supports and restraints.
d. Clearances for installing and maintaining insulation.
e. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
f. Equipment connections and support details.
g. Exterior wall and foundation penetrations.
h. Fire-rated wall and floor penetrations.
i. Sizes and location of required concrete pads and bases.
j. Clearances as required by Electric Code.

3. Indicate piping loads and support points for all piping 3" and larger, racked piping, and submit to the Structural Engineer for review and approval. Indicate the elevation, location, support points, and loads imposed on the structure at support, anchor points, and size of all lines. Indicate all beam penetrations and slab penetrations sized and coordinated. Indicate all work routed underground or embedded in concrete by dimension to column and building lines.

4. Indicate seismic support and restraint for all piping, ductwork and equipment, as specified under another section of this work.

5. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

6. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

7. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.

B. HVAC Coordination Drawings

1. This Contractor shall prepare a complete set of construction Coordination Drawings showing all of the HVAC work (equipment, piping, ductwork, conduit, etc.) to be installed as part of the work of this section of the specifications.

2. All seismic supports and restraints as part of the seismic design (as outlined under another section of this work) shall be shown on the coordination drawings.

3. The Coordination Drawings shall be prepared on electronic media (CADD) at not less than 3/8": 1'-0" scale.

4. Requirements for vibration isolation shall be shown on the coordination drawings by each trade.

5. The HVAC coordination drawings, shall serve as the base drawing to which all other contractors will overlay and add their work.

6. This Trade after showing all of the HVAC work shall forward the reproducible Coordination Drawings to the Plumbing Contractor.

7. The sequence of coordination drawings shall be HVAC-PLBG-FP-ELEC-GC.

8. The HVAC Contractor shall be designated as the lead contractor in the development of the composite layering process and shall be responsible for electronically restacking the various trade layers into the final composite (CADD) Drawings. Each trade shall draw their Work on separate layers represented by individual colors.

9. The HVAC Contractor shall attend a series of meetings arranged by the General Contractor to resolve any real or apparent interferences or conflicts with the work of the other Contractors or with ceiling heights shown on the architectural drawings.

10. The HVAC Contractor shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts.

11. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the HVAC Contractor shall “sign-off” the final Coordination Drawings.

12. The HVAC Subcontractor shall not install any of his work prior to “sign-off” of final Coordination Drawings. If HVAC work proceeds prior to sign-off of Coordination Drawings, any change to the HVAC work to correct the interferences and conflicts which result will be made by the HVAC Contractor at no additional cost to the project.

13. Coordination Drawings are for the HVAC Contractor’s and Owner’s use during construction and shall not be construed as replacing any shop, “as-built”, or Record Drawings required elsewhere in these Contract Documents.

14. Review of Coordination Drawings shall not relieve the HVAC Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.7 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, comply with the following.

1. A complete set of "as-built" or record drawings shall be made up and delivered to the Architect.

2. The drawings shall show

a. Ductwork mains and branches, size and location, for both exterior and interior; locations of all dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.

b. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Refer to Division 23 Section "Mechanical Identification." Indicate horizontal locations of underground piping.
c. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
d. Seismic restraints and supports.
e. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
f. All "main air" pneumatic control piping routing locations must be shown.
g. Updating of all equipment schedule sheets.

B. This trade shall submit the "as-built" set for approval by the building department in a form acceptable to the department, when required by the jurisdiction.

C. The drawings shall be produced using AutoCad 2010 or later software. The design drawings will be made available on disks in AutoCad format for use as a basis for the "as-built" drawings. These documents remain the property of Cosentini Associates and shall be used for no other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings. Prior to developing any "as-built" drawings, the contractor shall coordinate with the Owner and the Architect and Engineer the drawing layers, colors, etc., of the CAD drawings. "As-built" information shall be submitted as follows:

1. CAD drawing files on disks in AutoCad 2010 format.

2. Two (2) sets of drawings.

D. The quantity of design drawings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required "as-built" information.

E. Progress prints of record drawings shall be submitted monthly during the construction period for Architect's review.

1.8 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 01. In addition to the requirements specified in Division 01, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing instructions and lubrication charts and schedules.

5. List of spares: recommended for normal service requirements.

6. Parts list: identifying the various parts of the equipment for repair and replacement purposes.

7. Instruction books may be standard booklets but shall be clearly marked to indicate applicable equipment.

8. Wiring diagrams: generalized diagrams are not acceptable, submittal shall be specifically prepared for this project.

9. Automatic controls: diagrams and functional descriptions. (See control specification for additional requirements).

1.9 CODES, PERMITS AND INSPECTIONS

A. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over construction work at the project. These include, but are not limited to the following:

1. NFPA National Fire Codes

2. Guidelines for Construction and Equipment of Hospital and Health Care Facilities (latest Edition), by the U.S. Dept. Of Health and Human Resources

3. New York State Department of Health

4. New York State Building Codes

B. All required permits and inspection certificates shall be obtained, paid for, and made available at the completion of the work.

C. Any portion of the work which is not subject to the approval of an authority having jurisdiction, shall be governed by the applicable sections of the overall National Fire Code, as published by the National Fire Protection Association.

D. Installation procedures, methods, and conditions shall comply with the latest requirements of The Federal Occupational Safety and Health Act (OSHA).

E. Prepare and submit to the building department a set of "as-built" record drawings for approval, in a form acceptable to the building department.

F. This Contractor shall prepare all plans, amendments and pay all filing fees that will be required for the fuel burning installation, including boiler plant, gas/oil fired chillers, chimney, oil piping, fuel oil tanks, gas piping, breeching, and any or all parts of the system under the jurisdiction of the controlling agencies.

G. This Contractor shall prepare all plans, amendments and pay all filing fees that will be required for the emergency generator installation, including oil piping, engine exhaust, fuel oil tanks, and any or all parts of the system under the jurisdiction of the controlling agencies.

H. This Contractor shall prepare all plans, amendments, and pay all filing fees that will be required for the electric generator and electric generator fuel oil tank installation.

I. This Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction.

1.10 SEPARATION OF WORK BETWEEN TRADES

A. The specifications for the overall construction delineate various items of work under separate trade headings. The list below sets forth this delineation to the extent that it affects the HVAC work.

B. In the absence of more detailed information, this list shall be taken as a specific instruction to the heating, ventilating and air conditioning trade to include the work assigned to it.

C. Indications that the heating, ventilating and air conditioning trade is to perform an item of work mean that it is to perform the work for its own accommodation only, except as specifically noted otherwise.

D. Oth = Other than electrical or mechanical

Plb = Plumbing

Htg = Heating, Ventilating & Air Conditioning

Elec = Electrical

f = Furnished

i = Installed

p = Provided (furnished and installed)

| ITEM | OTH | PLB | HTG | ELEC | NOTES |
|---|---|---|---|---|---|
| Motors for mechanical equipment. | | | p | | |
| Motors starters and control devices for mechanical equipment. | | | p | | Specifications and drawings delineate exceptions. |
| Power wiring for mechanical equipment motors. | | | | p | Specifications and drawings delineate exceptions. |

| ITEM | OTH | PLB | HTG | ELEC | NOTES |
|---|---|---|---|---|---|
| Control wiring for motors. | | | p | | Specifications and drawings delineate exceptions. |
| Wiring for automatic dampers. | | | p | | Specifications and drawings delineate exceptions. |
| Temporary heat. | p | | | | |
| Temporary water. | p | | | | |
| Sealing of pressurized stairway, shafts and doors. | p | | | | |
| Undercutting of doors and door louvers. | p | | | | Supplying location where required included in HVAC. |
| Temporary light & power. | p | | | | |
| Hoisting | | | p | | |
| Rigging | | | p | | |
| Cutting, chasing & patching | p | | | | Cost where due to late installation or improper coordination of work is the responsibility of the delinquent trade. |
| Framed slots and openings in walls decks and slabs. | p | | | | Coordination drawings are required from HVAC trade. |
| Sleeves through non-membraned slabs, decks and walls. | | | p | | |
| Drilling & cutting of all holes in steel decks and precast slabs required for sleeves & supports. | | | p | | |
| Sleeves through membraned slabs, decks and walls. | | | p | | |
| Waterproof sealing of sleeves through membraned slabs, decks and walls. | | | p | | |

| ITEM | OTH | PLB | HTG | ELEC | NOTES |
|---|---|---|---|---|---|
| Fireproof sealing of excess openings in slabs, decks & fire rated walls. | | | p | | |
| Trenches in floor slabs | p | | | | |
| Wells or openings in piping for pressure, temperature, flow, etc. | | | p | | Wells and fittings furnished by BMS Contractor. |
| Fastenings | | | p | | |
| Supports | | | p | | |
| Base flashing to all roof penetrations | p | | | | |
| Roof vent and pipe cap flashing. | | | p | | |
| Roof vent and base flashing. | p | | | | |
| Roof curb cap flashing. | | | p | | |
| Roof curb base flashing | p | | | | |
| Concrete foundations, pads & bases inside buildings. | p | | | | Furnishing of anchors, vibration mounts and seismic restraints included in the HVAC trade. |
| Concrete foundations, pads & bases outside buildings. | | | p | | Furnishing of anchors, vibration mounts and seismic restraints included in the HVAC trade providing the associated equipment. |
| Field touch-up painting of damaged shop coats. | | | p | | |
| Finish painting of exposed work. | p | | | | Insulation coatings are by HVAC trade. |
| Exterior wall louvers. | p | | | | Duct connections & safing of all unused portions of louvers (2" thick insulated panel) is by HVAC Trade. |

| ITEM | OTH | PLB | HTG | ELEC | NOTES |
|---|---|---|---|---|---|
| Finished wall and ceiling access doors, panels and supporting frames. | p | | | | Supplying list locating all required access doors (none to be less than 16" x 16") included in HVAC. |
| Fire rated duct and pipe wrap enclosures | | | p | | |
| Steel dunnage for roof mounted AC units and HVAC equipment other than cooling towers. | | | p | | Coordinate with Architect and Structural Engineer. |
| Domestic make-up water piping for heating and air conditioning systems. | | p | | | Final connections included in heating, ventilation and air conditioning. |
| Rubbish removal | | | p | | where one trade furnishes and another installs, the installing trade removes the shipping and packing materials which accumulate. |
| Special tools for equipment maintenance. | | | f | | |
| Electric heaters with integral fans (cabinet heaters, unit heaters and the like). | | | p | | Line connections included in electric. Drawings delineate exceptions. |
| Trolley beams for equipment access and removal | | | p | | HVAC contractor to design trolley beams (and all additional required structural supports) to be located over equipment to permit removal of equipment. Coordinate with structural engineer. Trolley beams and supplemental steel to be provided by the HVAC contractor. |

E. The Heating, Ventilating and Air Conditioning Trade is required to supply all necessary supervision and coordination information to any other trades who are to supply work to accommodate the Heating, Ventilating and Air Conditioning installations.

F. Where the Heating, Ventilating and Air Conditioning trade is required to install items which it does not purchase, it shall include for such items:

1. The coordination of their delivery.

2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.

3. Their safe handling and field storage up to the time of permanent placement in the project.

4. The correction of any damage, defacement or corrosion to which they may have been subjected.

5. Their field assembly and internal connection as may be necessary for their proper operation.

6. Their mounting in place including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.

7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

G. Items which are to be installed but not purchased as part of the work of the Heating, Ventilating and Air Conditioning trade shall be carefully examined by this trade upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of the Heating, Ventilating and Air Conditioning trade will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work of the Heating, Ventilating and Air Conditioning trade shall include all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.11 DEFINITIONS AND INTERPRETATIONS

A. Specific items of terminology, as used herein or on drawings, shall have the following meanings.

1. "Piping"--Pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents, and items customarily required in connection with the transfer of fluids.

2. "Concealed"--Embedded in masonry or other construction, installed behind wall furring, within double partitions or hung ceilings, in crawl spaces, in shafts.

3. "Exposed"--Not concealed.

4. "By Other Trades" or "Others" or "Oth"--By persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of this Trade. In the event that this document is used to acquire work as part of a general construction contract the words "by other trades" shall mean by persons or parties who are not anticipated to be the sub-contractor for this trade working together with the general contractor. In this context the words "by other trades" shall not be interpreted to mean not included in the overall contract.

5. Where reference is made to N.E.M.A. Standards, it shall be understood that this reference is to the "Approved Standards", published by the National Electrical Manufacturers Association, Main Office – 1300 North 17th Street, Suite 1752, Rosslyn, Virginia 22209.

6. Where reference is made to "A.N.S.I. Standards", it shall be understood that this reference is to the standards published by the American National Standards Institute Incorporated.

1.12 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS:

A. As used in the drawings and specifications, certain non technical words shall be understood to have specific meanings as follows:

1. "Furnish"--Purchase and deliver to the project site complete with every necessary appurtenance and support.
2. "Install"--Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.
3. "Provide"--"Furnish" and "Install".

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.

C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.

D. No exclusions from, or limitations, in the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.

E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations The work shall be installed, in accordance with the diagrammatic intent expressed on the electrical and mechanical drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings and in accordance with the contractor's coordination drawings.

F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

I. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

J. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by Bulletin is subject to the base building specifications in all respects.

1.13 SEISMIC DESIGN

A. This project requires and must comply with seismic provisions for the support and restraint of equipment, components and piping. See Section 23 00 01 - "Seismic Design" for additional requirements.

1.14 SUSTAINABLE DESIGN

A. Insulation

1. All fiberglass insulation products shall be manufactured from recycled glass with a minimum of 30% post consumer recycled content by weight. Contractor shall submit manufacturers' certification of recycled content for approval.

2. All fiber glass insulation products used for ductwork, piping or equipment insulation shall be formaldehyde free.

B. Adhesives

1. All field or factory applied adhesives, sealants (used as fillers) prime painting and finish painting used on this project shall be of the type having limited capability to emit volatile organic compounds. Each adhesive shall meet the following emission factor limits:

| | |
|---|---|
| Total VOC's | 10.0 mg/m3/hr. |
| Formaldehyde | 0.05mg/m3/hr. |

2-Ethyl-1-Hexanol 3.0 mg/m3/hr.

2. The contractor shall submit a cut sheet and MSDS sheet for each adhesive to be used in the building mechanical system, highlighting VOC limits.

C. Sealants

1. All sealants used in mechanical systems shall be of the low volatile organic compound emitting type. All sealants shall have emission characteristics that do not exceed a VOC limit of 250 g/L. The contractor shall provide a cut sheet and MSDS sheet for each sealant to be used in the building mechanical system, highlighting VOC limits.

D. Paints

1. All paints used for equipment and systems to be installed on this project shall comply with Green Seal product requirements. The VOC emission characteristic for each paint must comply with a VOC limit of 150g/L for non-flat paints and 50 g/L for flat paints.

E. Sheet Metal Ductwork

1. All sheet metal ductwork shall be fabricated from sheet steel manufactured with a minimum recycled content of 20% post-consumer recycled content material by weight of 40% post-industrial recycled content material. Contractor shall submit certification of recycled content for approval.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 OPERATING INSTRUCTIONS

A. After all final tests and adjustments have been completed, fully instruct the proper Owner's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.

3.2 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks or defects. Any defective materials or workmanship as well as damage to the work of all trades resulting from same shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use. For example, in the case of refrigeration systems, it means that the plant has a cooling load. Similarly, for all other systems.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Non-durable replaceable items such as air filter media do not require replacement after the date of acceptance. If received in writing, requests to have earlier acceptance dates established for these items will be honored.

E. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of heating and air conditioning equipment.

3.3 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 02 through 26 for rough-in requirements.

3.4 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

B. Coordinate mechanical systems, equipment, and materials installation with other building components.

C. Verify all dimensions by field measurements.

D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.

E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

F. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

1. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

2. 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. Provide required connection for each service.

3. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.

4. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

5. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

6. Install access panel or doors for maintenance or inspection where units are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "ACCESS DOORS" and Division 23 Section 23 05 50 - Basic Mechanical Materials and Methods.

7. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.5 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 01, the following requirements apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed Work.

2. Remove and replace defective Work.

3. Remove and replace Work not conforming to requirements of the Contract Documents.

4. Remove samples of installed Work as specified for testing.

5. Install equipment and materials in existing structures.

6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

1. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

    a. Refer to Division 01 Section "DEFINITIONS AND STANDARDS" for definition of "experienced Installer."

2. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

    a. Refer to Division 01 Section "DEFINITIONS AND STANDARDS" for definition of "experienced Installer."

3.6 SITE VISITATION SURVEYS AND MEASUREMENTS

A. All existing conditions cannot be completely detailed on the drawings. These include, but are not limited to piping fixtures, equipment, etc. This contractor shall survey the site and include all required costs in making up their bid proposal.

B. The contractor shall visit the premises to determine existing conditions and compare same with drawings and specifications and satisfy himself of all conditions prior to the submission of a bid proposal. No allowance will be made for failure to comply with these requirements and a bid proposal shall be construed as evidence he has done so.

C. Before submitting bid, visit the project site to satisfy yourself that all equipment shown or specified in the project contract documents can be installed generally as shown. Advise Owner prior to bid date, of any space or other installation problems.

D. Before submitting bid, become thoroughly familiar with all conditions under which work will be installed, as you will be held responsible for any assumptions, any omissions or errors made as a result of failure to become familiar with the site and Contract Documents.

E. Investigate each space through which equipment must be moved. Where necessary, equipment shall be shipped from manufacturer in sections of size suitable for moving through restrictive spaces available. Ascertain from building Owner at what time of day equipment may be moved through certain restrictive areas.

F. Install work so as to be readily accessible for operation, maintenance and repair. Minor deviations from drawings may be made to accomplish this, but changes which involve extra cost shall not be made without approval.

G. Removal and relocation of certain existing work will be necessary for the performance of the general work. All existing conditions cannot be completely detailed on the drawings. The Contractor shall survey the site and include all required changes in making up their bid proposal.

H. Submission of a bid shall be construed as evidence, that a careful examination of the portions of the existing building, equipment, etc., which affect this work and the access to such spaces has been made and that the Contractor is familiar with existing conditions and difficulties that will affect the execution of the work. Claims will not be allowed for labor, equipment or materials required because of difficulties encountered, which could have been foreseen during such an examination.

3.7 REMOVALS AND ALTERATIONS

A. This contractor shall provide all required labor, materials, equipment and perform all operations for complete demolition, removal and relocation of the existing work as indicated on the drawings and/or as specified or described and/or as required for the performance of the general work under this contract.

B. All removed equipment and material shall be removed from the project site.

C. Unless otherwise specifically specified, include all cutting and patching of existing floors, walls, partitions and other materials in the existing building. The Contractor shall restore these areas to original conditions.

D. Provide alteration work as shown on drawings or described herein. If asbestos is present or suspected to be present inform the Owner in writing so that such removal can be carried out by qualified personnel hired by the Owner. Do not commence demolition until such work has been completed.

3.8 CONNECTIONS TO EXISTING WORK

A. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing facilities. Submit to the Owner for approval, date schedule of necessary temporary shut-downs of existing services. All shutdowns shall be made at such times as will not interfere with regular operation of existing facilities and only after written approval of Owner. To insure continuous operation, make necessary temporary connections between new and existing work. All costs resulting from temporary shut-downs shall be borne by this Contractor.

B. All shutdowns shall be done on overtime.

C. The drawings of necessity utilize symbols and schematic diagrams to indicate connections to existing work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations.

D. The contractor shall coordinate all connections to existing work with the facility engineer. Contractor shall field verify exact location of all existing services.

E. Connect new work to existing work in neat and approved manner. Restore existing work disturbed to original condition.

F. All piping, fittings and valves shall be in accordance with utility company specifications.

G. See section 23 05 50 for Welding Procedure.

3.9 PRECONSTRUCTION TESTING - EXISTING PIPING SYSTEMS

A. Prior to the removal **or modification** of any existing ~~or modification~~ piping and/or the installation **and tie-in** of any new piping on the 17th Floor (MER), this contractor shall **provide flow testing services and shall** test the existing chilled water flow rates in the main **distribution piping, all branch piping serving air handling units, and at each of (6) air handling units.** ~~piping and all branches.~~ Contractor shall retest and obtain flow readings **at all test locations and rebalance the existing air handling units and pumps. Design flow rates for the air handling units will be provided prior to balancing** ~~for all main and branch piping~~ at the completion of construction.

B. This contractor shall submit the test results to the architect and engineer for review.

3.10 PRE-OCCUPANCY SPACE FLUSH OUT

A. At completion of construction, prior to turn over of the building, the contractor shall conduct a pre-occupancy flush out of the system as follows:

1. All supply air systems shall be run at 100% fan capacity for a period of two weeks.

2. During the flush out, all outside air dampers shall be locked into the 100% outside air position. Return air dampers shall be fully closed and all spill air dampers shall be 100% open. Exhaust fans shall be operated at 100% exhaust.

3. Cooling and/or heating coil valves shall be controlled by the building management system to provide properly tempered and dehumidified air.

   a. Supply air temperature shall be set to provide a maximum space temperature of 78°F, minimum space temperature of 66°F and a maximum space humidity of 60% RH.

4. All exhaust fans that are required to run to maintain proper building pressurization shall be operated at 100% fan capacity for the flush out period.

3.11 REFRIGERANT HANDLING

A. Refrigerant Installation and Disposal: Perform all work related to refrigerant contained in cooling coils, air conditioners, and similar equipment, including related piping, in strict accordance with the following requirements:

1. ASHRAE Standard 15 and Related Revisions: Safety Code for Mechanical Refrigeration.

2. ASHRAE Standard 34 and Related Revisions: Number Designation and Safety Classification of Refrigerants.

3. United States Environmental Protection Agency (US EPA) requirements of Section 808 (Prohibition of Venting and Regulation of CFC) and applicable State and local regulations of authorities having jurisdiction.

B. Recovered refrigerant is the property of the Contractor. Dispose of refrigerant legally, in accordance with applicable rules and regulations of authorities having jurisdiction.

END OF SECTION 23 05 00

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# SECTION 23 05 15 - VARIABLE FREQUENCY CONTROLLERS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. This Section includes furnishing of solid-state, PWM, VFCs for speed control of three-phase, squirrel-cage induction motors.

### 1.2 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. Related Sections: The following Sections contain requirements that relate to this Section:

1. Section 23 00 01 “Seismic Design”.

2. Section 23 05 00 “Common Work Results for HVAC”.

3. Section 23 05 50 “Basic Mechanical Materials and Methods”.

4. Division 23 Section “Enclosed Controllers” for control wiring.

5. This section is a part of each Division 23 section.

6. Division 26 ELECTRICAL

7. Division 26 Section “Variable Frequency Controllers (Installation of)” for installation of VFC’s.

### 1.3 DEFINITIONS

A. BMS: Building management system.

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFC: Variable frequency controller.

### 1.4 SUBMITTALS

A. Product Data: For each type of VFC. Include dimensions, mounting arrangements, location for conduit entries, shipping and operating weights, and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.

B. Shop Drawings: For each VFC.

1. Include 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:

a. Each installed unit's type and details.
b. Nameplate legends.
c. Short-circuit current rating of integrated unit.
d. UL listing for series rating of overcurrent protective devices in combination controllers.

2. Wiring Diagrams: Power, signal, and control wiring for VFCs, including connections for external wiring. Provide schematic wiring diagram for each type of VFC.

C. Manufacturer Seismic Qualification Certification: Submit certification that VFCs, accessories, and components will withstand seismic forces as specified under another section of this work. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For VFCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section “Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for VFCs and all installed components.

F. Harmonics: Submit calculations to demonstrate that the total harmonics produced by all of the VFC’s connected to the system at the electrical service point shall be no greater than the allowable harmonics as follows:

1. The total harmonics produced by all of the VFC's connected to the system, including VFC's provided integral with HVAC equipment, at the Point of Common Coupling (PCC) shall be no greater than the allowable harmonics for Special systems as specified by IEEE Standard 519 tables 10.2 and 10.3, based on the installed source KVA. The PCC shall be the primary side of the electrical service transformer(s) for calculating current distortion, and the PCC shall be the secondary side of the electrical service transformer(s) for calculating voltage distortion. Where the installed source KVA is not indicated on the Electrical drawings, calculations shall be based on 60 percent of the KVA of the service switches.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain VFCs of a single type 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, and marked for intended use.

C. Comply with NFPA 70, as amended by state and local codes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:

1. Ambient Temperature: 0 to 40 deg C.

2. Humidity: Less than 90 percent (noncondensing).

3. Altitude: Not exceeding 3300 feet (1000 m).

1.7 COORDINATION

A. Coordinate layout and installation of VFCs 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 features of VFCs, installed units, and accessory devices with pilot devices and control circuits to which they connect.

C. Coordinate features, accessories, and functions of each VFC and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The following vendors will be reviewed for approval providing they meet all of the performance requirements of the specifications.

1. ABB Power Distribution, Inc.; ABB Control, Inc. Subsidiary.

2. Eaton Corporation; Cutler-Hammer Products.

3. General Electric Company; GE Industrial Systems.

4. Siemens Energy and Automation; Industrial Products Division.

5. Square D.

6. Unico, Inc.

7. Yaskawa Electric America

2.2 VARIABLE FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.

1. Provide unit suitable for operation of standard efficiency and premium efficiency motors as defined by NEMA MG 1.

2. VFC(s for operation of motors 30 horsepower and larger are equipped with 12 pulse or greater inverter sections.

3. VFC(s for operation of motors less than 30 horsepower are equipped with 6 pulse or greater inverter sections.

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 60 Hz, with voltage proportional to frequency throughout voltage range.

D. Unit Operating Requirements:

1. Input ac voltage tolerance of 208 V, plus or minus 5 percent and 380 to 500 V, plus or minus 10 percent.

2. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.

3. Minimum Efficiency: 96 percent at 60 Hz, full load.

4. Minimum Displacement Primary-Side Power Factor: 96 percent.

5. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.

6. Starting Torque: 100 percent of rated torque or as indicated.

7. Speed Regulation: Plus or minus 1 percent.

E. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.

F. Internal Adjustability 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 a minimum of 22 seconds.

4. Deceleration: 2 to a minimum of 22 seconds.

5. Current Limit: 50 to a minimum of 110 percent of maximum rating.

G. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors.

2. Under- and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.

3. Motor Overload Relay: Adjustable and capable of NEMA ICS 2, Class 20 performance.

4. Skip frequencies: Drive is arranged to skip a minimum of 3 field adjustable frequencies where the controller-motor-load combination operates at a natural resonant frequency of the combination. Each is adjustable with a selectable bandwidth.

5. Instantaneous line-to-line and line-to-ground overcurrent trips.

6. Loss-of-phase protection.

7. Reverse-phase protection.

8. Short-circuit protection.

9. Motor over-temperature fault.

10. Control circuit (120 volts) for interlocking with dry contacts in load side motor disconnect to disable start-up attempts with system open.

11. Snubber networks to project against malfunction due to system voltage transients.

H. Multiple-Motor Capability: Controller suitable for service to multiple motors and having a separate overload relay and protection for each controlled motor. Overload relay shall shut off controller and motors served by it when overload relay is tripped.

I. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Attempts unlimited restarts after controller fault or on return of power after an interruption where serving motors used for smoke control systems, with no manual intervention required. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.

J. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.

K. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

L. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

M. Decelerating Energy Absorption: Means of absorbing energy released by decelerating motor (and its driven load) without damage to VFC, motor, or load.

N. Input Line Conditioning: Line reactors (5 percent) on 6 pulse VFCs to reduce harmonics produced by the VFC's.

1. Protect each VFC against injurious overheating at its full load rating.

2. Line reactors are incorporated as an integral part of the controller equipment in a single cabinet. Include all required field wiring.

O. DC Bus choke: For harmonic distortion reduction.

P. VFC Output Filtering: The variable frequency controllers are suitable for use with standard NEMA Design B motors having a service factor of 1.15 without producing any injurious "ringing" over-voltages as the motor terminals. Incorporate L-C filters (and/or other items) in the output of the drive as required to prevent such over voltages based on the circuit length from VFC to motor. Provide written certification of the suitability of the VFC for use with "standard motors."

Q. Status Lights: Door-mounted LED indicators shall indicate the following conditions:

1. Power on.

2. Run.

3. Overvoltage.

4. Line fault.

5. Overcurrent.

6. External fault.

R. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

S. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (VDC).
9. Set-point frequency (Hz).
10. Motor output voltage (V).

T. Control Signal Interface:

1. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V and 0/4-20 mA) and 6 programmable digital inputs.
2. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems (coordinate requirements with BMS Contractor):
    a. 0 to 10-V dc.
    b. 0-20 or 4-20 mA.
    c. Potentiometer using up/down digital inputs.
    d. Fixed frequencies using digital inputs.
    e. RS485.
    f. Keypad display for local hand operation.
3. Output Signal Interface:
    a. A minimum of 2 analog output signals (0/4-20 mA), which can be programmed to any of the following:
        (i) Output frequency (Hz).
        (ii) Output current (load).
        (iii) DC-link voltage (VDC).
        (iv) Motor torque (percent).
        (v) Motor speed (rpm).

(vi) Set-point frequency (Hz).

4. Remote Indication Interface: A minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of each of the following:

   a. Motor running.
   b. Set-point speed reached.
   c. Fault and warning indication (overtemperature or overcurrent).
   d. PID high- or low-speed limits reached.

5. Damper Control Interface: Closes a dry contact upon a start command to open associated dampers before the motor is allowed to operate in drive or bypass mode. Input to accept damper limit switch contact closure to allow the motor to operate.

6. Safety Control Interface: Input to accept safety device dry contact closure to stop motor operation in drive and bypass mode.

7. Over-ride Control Interface: Input to accept control system dry contact closure to start motor operation in drive mode at variable speed and in bypass mode.

U. Communications: Provide an RS485 interface allowing VFC to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control, and all output signals and alarms of VFC to be monitored by BMS. Provide capability for VFC to retain settings programmed via BMS control within the nonvolatile memory. **VFC shall be configured with a BACNET MS/TP interface for direct communication with Johnson Control's Metasys BMS.**

V. Manual Bypass: Magnetic contactor arranged to safely transfer motor between controller output and bypass controller circuit when motor is at zero speed. Controller-off-bypass selector switch sets mode, and indicator lights give indication of mode selected. Unit shall be capable of stable operation (starting, stopping, and running), with motor completely disconnected from controller (no load).

W. Bypass Controller: NEMA ICS 2, full-voltage, nonreversing enclosed controller with across-the-line starting capability in manual-bypass mode. Provide motor overload protection under both modes of operation with control logic that allows common start-stop capability in either mode. Bypass controller for motors 75 HP and larger (10 HP and larger where supplied from an emergency generator) are provided with solid-state reduced voltage controller (soft-start) in series with the bypass contactor, as specified in Division 23 Section "Enclosed Controllers".

X. Integral Disconnecting Means: NEMA KS 1, nonfusible switch with lockable handle.

Y. Isolating Switch: Non-load-break switch arranged to isolate VFC and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

## 2.3 ENCLOSURES

A. NEMA 250, Type 1 enclosure unless otherwise indicated.

2.4 ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Control Relays: Auxiliary and adjustable time-delay relays.

D. Standard Displays:

1. Output frequency (Hz).

2. Set-point frequency (Hz).

3. Motor current (amperes).

4. DC-link voltage (VDC).

5. Motor torque (percent).

6. Motor speed (rpm).

7. Motor output voltage (V).

2.5 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested VFCs before shipping.

PART 3 - EXECUTION

3.1 APPLICATION

A. Select features of each VFC to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, drive and load.

B. Select rating of controllers to suit motor controlled.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:

1. Inspect variable frequency controllers, wiring, components, connections, and equipment installation. Test and adjust variable frequency controllers, components, and equipment in accordance with NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameter.

2. Operate variable frequency controller throughout its full frequency range and program to skip frequencies where the controller-motor-load combination operates at a natural resonant frequency of the combination.

3. Complete installation and startup checks according to manufacturer's written instructions.

4. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

4. Report results in writing.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain variable frequency controllers. Refer to Division 1 Section “Demonstration and Training."

3.4 INSTALLATION

A. VFC’s to be installed as part of Division 16 work.

3.5 CONTROL WIRING

A. Provide control wiring as specified in Division 23 Section “Enclosed Controllers”.

END OF SECTION 23 05 15

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# SECTION 23 07 00 - HVAC INSULATION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. This section includes the following basic mechanical materials and methods to complement other Division 23 Sections.

B. Insulation for ductwork, piping, and equipment as described.

### 1.2 RELATED DOCUMENTS

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

B. Section 09 90 00 - Painting: Painting and Coating.

C. Section 23 00 01 - Seismic Design.

D. Section 23 05 00 - Common Work Results for HVAC.

E. Section 23 05 50 - Basic Mechanical Materials and Methods.

F. This section is a part of each Division 23 Section.

### 1.3 REFERENCES

A. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

B. ASTM C335 - Thermal Conductivity of Pipe Insulation.

C. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

E. NFPA 255 - Surface Burning Characteristics of Building Materials.

F. UL 723 - Surface Burning Characteristics of Building Materials.

### 1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in ductwork insulation application with three years minimum experience.

B. Insulation Materials: Insulation materials shall be manufactured at facilities certified and registered to conform to ISO 9000 Quality Standard.

C. Insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E.84, NFPA 255 or UL 723 not exceeding:

Flame Spread: 25

Smoke Developed: 50

1. Accessories such as adhesives, mastics, cements, and tapes for fittings shall have the same component rating as listed above. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed requirements. Treatment of jackets or facings to impart flame and smoke-safety shall be permanent. The use of water soluble treatments is prohibited.

D. Asbestos shall not be used in the manufacture of insulation products.

1.6 SEISMIC DESIGN

A. This project is located within a seismic zone requiring special provisions for support and restraint of equipment, components, and piping. See Section 23 00 01 - Seismic Design for additional requirements.

1.7 SUBMITTALS

A. Submit product data under provisions of Section 01 30 00.

B. Include product description, list of materials and thickness for each service, and locations.

C. Submit manufacturer's installation instructions under provisions of Section 01 30 00.

PART 2 - PRODUCTS

2.1 GENERAL

A. All fiberglass insulation products, specified herein, shall be manufactured from recycled glass with a minimum of 30% post consume recycled content by weight. Contractor shall submit manufacturers' certification of recycled content for approval.

1. All fiberglass insulation products used for ductwork, piping, or equipment insulation shall be formaldehyde free.

B. Adhesives

1. All adhesives used on this project shall be of the type having limited capability to emit volatile organic compounds. Each adhesive shall meet the following emission factor limits:

Total VOC's: 10.0 mg/m3/hr.
Formaldehyde: 0.05mg/m3/hr.
2-Ethyl-1-Hexanol: 3.0 mg/m3/hr.

2. The contractor shall submit a cut sheet and MSDS sheet for each adhesive to be used in the building mechanical system, highlighting VOC limits.

C. Sealants

1. All sealants used in mechanical systems shall be of the low volatile organic compound emitting type. All sealants shall have emission characteristics that do not exceed a VOC limit of 250 g/L. The contractor shall provide a cut sheet and MSDS sheet for each sealant to be used in the building mechanical system, highlighting VOC limits.

2.2 INSULATION FOR PIPING

A. Piping systems described shall be insulated as follows, including all flanges, fittings, valves, expansion joints, vents, drains and all other parts of the system. All piping subject to freezing such as in outdoor air or discharge plenums or outdoors shall be insulated with a minimum of 2" insulation.

B. Insulation on all cold surfaces must be applied with a continuous unbroken vapor seal. Hangers, supports, anchors, etc. that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.

C. Insulation for outdoor piping shall be as described in Weatherproofing Finishes for Outdoor Insulation.

D. Schedule of Insulation Type and Minimum Thickness:

| PIPING SYSTEM | THICKNESS | TYPE |
|---|---|---|
| Chilled water supply and return.<br>Up to 1½”<br>2" and over | <br>1"<br>1-1/2" | <br>P-1<br>P-1 |
| Refrigerant suction | 1-1/2" | P-1 |
| Drain from A.C. units, fan coil units, cooling coil drip pans, and miscellaneous piping subject to sweating. | ½" | P-2 |
| Domestic make-up water | ½" | P-2 |
| Hot water supply and return<br>(100ºF to 205ºF)<br><br>up to 1½<br>"2" and above | <br><br><br>1"<br>2" | <br><br><br>P-3<br>P-3 |
| Low pressure steam<br>(0 to 15 PSIG)<br><br>up to 1½" I.P.S.<br>2” to 6" I.P.S.<br>Over 6" | <br><br><br>1½”<br>3"<br>3½” | <br><br><br>P-3<br>P-3<br>P-3 |

| PIPING SYSTEM | THICKNESS | TYPE |
|---|---|---|
| Low pressure steam condensate return, humidification steam and condensate pump discharge | | |
| up to 1½" I.P.S. | 1½" | P-3 |
| 2" to 6" I.P.S. | 3" | P-3 |
| Over 6" | 3½" | P-3 |

E. Type P-1 Glass Fiber for Cold Pipes

1. Insulation shall be glass fiber with a maximum K factor of .24 at 75 degrees F mean temperature with factory applied all-service jacket.

2. Insulation shall be rigid, molded, one-piece, fiberglass insulation that is bonded with thermosetting resin, similar to Schuller Micro-Lok with AP-T Plus Jacket.

3. The longitudinal lap of the All Purpose Jacket shall have a pressure sensitive tape lap sealing system. Butt joints shall be sealed using manufacturer supplied butt strips.

4. All fittings, valves, flanges and pipe terminations shall be fully insulated with glass fiber insulation and molded fitting covers. Thickness of insulation shall be at least as great as that on the adjoining pipe and shall be vapor sealed.

5. Flange insulation shall extend a minimum of 1" beyond the end of the bolts, and the bolt area shall be filled with Mineral Wool Cement.

F. Type P-2 Glass Fiber for Anti-Sweat Insulation:

1. Same material and application techniques as for Type P-1.

G. Type P-3 Glass Fiber for Hot Pipes:

1. Insulation shall be glass fiber with a maximum K factor of .24 at 75 degrees mean temperature and shall be furnished with a factory applied all-service jacket.

2. Insulation shall be capable of continuous service at a pipe temperature of 450°F without oxidation, burnout of binders, or development of odors or smoke.

3. Insulation shall be rigid, molded, one piece fiberglass insulation that is bonded with thermosetting resin, similar to Schuller Micro-Lok with AP-T Plus Jacket.

4. The longitudinal lap of the All Purpose Jacket shall have a pressure sensitive tape sealing system. Butt joints shall be sealed using manufacturer supplied butt strips.

5. All fittings, valves, flanges and pipe terminations shall be fully insulated with glass fiber insulation and molded fitting covers. Thickness of insulation shall be at least as great as that on the adjoining pipe.

6. Flange insulation shall extend a minimum of 1" beyond the end of the bolts, and the bolt area shall be filled with Mineral Wool Cement.

2.3 INSULATION FOR SHEET METAL

A. Note that ductwork and casings which are acoustically lined, as described elsewhere, need not be insulated on the exterior.

B. Insulate sheet metal as follows:

1. All air conditioned and/or heated low pressure supply ductwork from fan discharge and from devices which reduce air pressure to diffusers, grilles and registers including diffuser plenums - 1-1/2" Type D-1 for round ducts and concealed rectangular ducts - 1" Type D-2 for exposed rectangular ducts.

a. Note that insulation (with vapor barrier) shall be continuous across all duct joints, hot water reheat coil pipe bends (insulated end caps), diffusers, etc. so as to provide a continuous, fully insulated with uninterrupted vapor barrier from the fan discharge to the diffusers.

2. All return air ductwork shall be insulated similar to low pressure supply ductwork.

3. All medium pressure ductwork from fan discharge to any air terminal device which reduces air pressure -1-1/2" Type D-1 for round ducts and concealed rectangular. 1" Type D-2 for exposed rectangular ducts. All low pressure ductwork from air terminal device which reduces pressure to diffusers, grilles, and registers - 1-1/2" Type D-1.

a. Note that insulation (with vapor barrier) shall be continuous across all duct joints, hot water reheat coil pipe bends (insulated end caps) diffusers, etc. so as to provide a continuous, fully insulated with uninterrupted vapor barrier from the fan discharge to the diffusers.

4. Ducts and sheet metal plenums behind louvers containing all or a percentage of outside air on inlet side of air handling units and ventilation fans - 2" Type D-2.

5. All supply air sheet metal plenums - 2" Type D-2.

6. Exhaust air ductwork from automatic dampers to discharge louvers (including sheet metal plenums behind louvers) - 2" type D-2.

7. Non air conditioned and non heated outside air supply (except in unheated areas such as garages) - 2" type D-1 for concealed ducts, 2" type D-2 for exposed ducts.

8. All outside air supply (other than garage) - 2" Type D-2.

C. Type D-1 Flexible Duct Insulation With Vapor Barrier

1. Flexible duct insulation shall be 1 lb per cu. ft. density glass fiber with a maximum K factor of 0.29 at 75 degrees F. mean temperature, with reinforced foil-faced, flame resistant kraft vapor barrier.

2. Insulation shall be secured with duct adhesive. All joints shall be sealed by adhering a 2" sealing lap at all joints with vapor barrier adhesive or 3" strips of vapor barrier jacket applied with vapor barrier adhesive. Insulation shall then be fastened with 16 gauge copper-clad wire or fiberglass cord on 12" centers. On ducts over 24" wide, welded pins & clips shall be used on the underside.

3. Exposed round shall have a white vinyl reinforced foil vapor barrier. Application same except wires shall be omitted and blanket shall be secured by stapling 2" longitudinal lap. Staples shall be coated with vapor barrier coating.

D. Type D-2 Rigid Duct Insulation With Vapor Barrier:

1. Rigid duct insulation shall be 4.2 lbs per cu. ft. density glass fiber with maximum K factor of .24 at 75 degrees F mean temperature with vapor barrier facing.

2. Insulation shall be impaled over welded pins applied to duct surface on 12" to 18" centers. Use a minimum of two rows of fasteners on each side of duct. Secure insulation with suitable speed washers or clips firmly imbedded into insulation.

3. All joints and voids in the insulation shall be filled with Mineral Wool Cement. All joints, speed washers and breaks in the vapor barrier shall be sealed with 3" wide strips of the vapor barrier facing adhered with vapor barrier adhesive.

4. Exposed duct work shall have a white reinforced foil vapor barrier facing. Care shall be taken in sealing joints speed washers, etc. with matching strips of vapor barrier to insure good appearance.

2.4 INSULATION FOR EQUIPMENT~~, BREECHINGS, & KITCHEN EXHAUST~~

A. The following Cold Equipment shall be insulated with Vapor Barrier Board Insulation using Type E-1 insulation.

1. Heat Exchangers - 2 inches.

2. Chilled Water Pumps, Secondary Water Pumps, and Expansion Tanks - 1 inch.

3. Single Inlet Fans Downstream of Cooling Coils - 2 inches.

B. The following Hot Equipment shall be insulated with Semi-Rigid Board Insulation using Type E-2 Insulation.

1. Hot Water Converters and Generators ) 1 inch.
) 250°F max.

C. Type E-1 Glass Fiber Rigid Equipment Insulation With Vapor Barrier:

1. Insulation shall be 4.2 lb. per cu. ft. density glass fiber with vapor barrier facing and having a maximum K factor of 0.24 at 75 degrees F mean temperature.

2. Insulation shall be firmly held in place with copper clad wire or pins and clips on 12" centers.

3. All joints and voids in the insulation shall be filled with mineral wool cement. All joints and breaks in the vapor barrier shall be sealed with strips of the vapor barrier facing adhered with vapor barrier adhesive.

4. Finish shall consist of imbedding an open weave glass fabric (20 x 20) into wet coating of lagging adhesive over-lapping the seams at least 2". A finish coat of lagging adhesive shall then be applied.

5. Sections of equipment requiring periodic servicing such as heads and pumps shall be insulated with sheet metal covers lined with 4.2 lb. density fiber glass board.

D. Type E-2 Glass Fiber Rigid Equipment Insulation:

1. Insulation shall be 4.2 lb. per cubic foot density glass fiber having a maximum K factor of .24 at 75 degrees F mean temperature.

2. Insulation shall be firmly held in place with copper-clad wire or pins and clips on 12" centers.

3. All joints and voids in the insulation shall be filled with mineral wool cement.

4. Over the insulation apply 1" galvanized wire netting secured to the bands or wires and pulled down tight. They apply 1 coat of Insulating and Finishing Cement troweled to a smooth finish.

5. Exposed equipment shall be finished by embedding open weave glass fabric (20 x 20) into wet coating of lagging adhesive overlapping seams 2". A finished coat of lagging adhesive shall then be applied.

6. Sections of equipment requiring periodic servicing such as heads and pumps shall be insulated with sheet metal covers lined with 4.2 lb. density fiber glass board.

## 2.5 WEATHERPROOFING FINISHES FOR OUTDOOR INSULATION

A. Outdoor Piping

1. Piping shall be insulated as specified under “Insulation for Piping” and provided with a weatherproof finish as described herein.

2. Finish with a .016" thick aluminum jacket which has a factory applied moisture barrier. For all applications where it is available, the jacketing shall be factory attached to the insulation and installed per manufacturer's recommendation.

3. Where field applied jacketing must be used, it shall be applied with 2" overlap facing down from the weather and shall be secured with an aluminum band (½" x .020"), and seals applied on 12" centers with bands applied directly over butt overlaps. As an alternate, the jacketing may be applied with Pli-Grip Rivets. Where jacketing is cut out or abuts an uninsulated surface, the joint shall be sealed with Insul-Coustic Sure Joint 405, or BF 30-45 Foam seal.

4. Fittings and valves shall be insulated and finished with mitered sections of the insulation with factory attached aluminum jackets installed per manufacturer's recommendation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

C. Do not startup and operate chilled water system prior to completion of insulation for the entire chilled water piping system and complete closure of building from the external atmosphere.

D. Do not operate air handling system with conditioned air prior to completion of insulation of the entire duct distribution system for that air handling system.

3.2 INSTALLATION

A. Insulation shall be applied on clean dry surfaces, after inspection and release for insulation application.

B. Insulate all valves, flanges, couplings and fittings. Valve and flange insulation shall be removable and reinstallable.

C. Do not startup and operate chilled water system prior to completion of insulation for the entire chilled water piping system and complete closure of building from the external atmosphere.

D. Do not operate air handling system with conditioned air prior to completion of insulation of the entire duct distribution system for that air handling system.

E. Full lengths of insulation shall be used except at end of straight sections and as required to accommodate fittings. Insulation shall be applied with the joints tightly fitted together. Cracks or voids shall be filled with insulation. Manufacturer's recommended installation procedures shall be strictly adhered to.

F. Insulation shall be continuous through wall and ceiling openings and sleeves. Where insulated piping or ductwork pierces fire rated partitions, walls, and floors, substitute anhydrous calcium silicate insulation with vapor barrier in lieu of fiberglass for a minimum of 8" from wall, to produce a hard surface for fire resistive packing.

G. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold services shall be adequately insulated and vapor sealed to prevent condensation.

H. The edges and seams at all visible locations shall be finished in a neat and workmanlike manner.

I. All exposed ductwork insulation shall be applied with edges butted. Insulation shall be impaled over stick clips or pins welded to the duct, and secured with speed clips. Spacing of pins shall be as required to hold insulation firmly in place but not less than one pin per square foot. All joints and penetrations of the vapor barrier shall be sealed with a 3" wide strip of the same material, supplied with vapor barrier adhesive to both surfaces as recommended by adhesive manufacturers.

J. Blanket insulation shall be tightly sealed at all joints and seams. Insulation shall be cut longer than ductwork perimeter to allow maximum thickness on all areas and avoid excessive compression. All joints shall be over lapped at least 2" and stapled in place. The stapled seams shall be sealed with a minimum 3" wide pressure sensitive tape designed for use with the duct insulation. All breaks in the vapor barrier facing shall also be sealed with the tape. The underside of ductwork 18" or greater in width, and vertical surfaces 48" or greater shall have the insulation additionally secured with mechanical fasteners and speed clips spaced approximately 12" on center. The protruding ends of the fasteners shall be cut off flush after the speed clips are installed, and then sealed with the same tape as specified above.

K. Inserts shall be installed at hangers for cold insulated piping. Inserts between the pipe and pipe hangers shall consist of rigid pipe insulation of equal thickness to the adjoining insulation and shall be provided with vapor barrier where required. Inserts shall have sufficient compressive strength so that when used in combination with a sheet metal shield, they support the weight of the pipe and the fluid in it without crushing the insulation.

L. Finished installation shall provide a continuous and effective vapor barrier.

M. Refer to details on drawings.

3.3 SCHEDULE

A. As described under products.

END OF SECTION 23 07 00

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SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1. Section 23 05 00 - Common Work Results for HVAC.

2. Section 23 05 50 - Basic Mechanical Materials and Methods.

3. This section is a part of each Division 23 Section (Mechanical).

4. Specified elsewhere:

5. Variable Speed Control

6. Motors

7. HVAC Pumps

8. Terminal Heat Transfer Units

9. Fans

10. Air Handling Units

11. Testing, Adjusting and Balancing

12. Basic Elec. Materials Methods

13. Electrical Wiring

B. Technical Proposals

1. Technical proposals shall be prepared in accordance with these specifications. Four (4) copies of the proposal shall be submitted with the bid. Proposals that are unbound, loose, loose in a file folder, stapled, stapled in a manila file folder, etc., will not be acceptable. The technical proposal shall include the following data/information as a minimum. The order of listing here is not intended to indicate, nor should it be construed to indicate, the relative importance of the data/information:

a. Information on organizational capability to handle this project (management, personnel, manufacturing, single source responsibility, etc.). Provide an organizational chart of the local factory branch office indicating the project team and each person's role in the project. Provide a resume for each project team member and all management personnel.

b. A comprehensive bar chart project schedule indicating submission of shop drawings, equipment delivery, installation, start-up commissioning, training, milestones, and all critical path tasks.

c. A project specific on-site and off-site training program which demonstrates specification compliance.

d. BMS Configuration as Proposed:

2. Modularity.

3. Provisions against obsolescence due to technological advancement.

4. Detailed description of all operating, command, application and energy management software provided for this project.

5. Provide a riser drawing of the system architecture. The drawing shall indicate the model number, location and service of each primary control panel, secondary control panel, and all other network hardware.

6. A complete description of all interface and/or integration packages.

7. Provide a complete submittal of all hardware, software, sensors and end devices (valves, damper operators, airflow stations, etc.).

8. Description of manual override operation and BMS monitoring of manual override operation and BMS monitoring of manual override for each type control point in system.

9. A list of references (include Owner contact name and phone number) for five (5) projects completed by the local branch office within the last five years of similar size, schedule and complexity.

10. A signed certificate stating the Contractor “has read the performance and functional requirements, understands them, and the technical proposal will comply with all parts of the specification” or a signed line by line specification concordance statement. Certificate or statement shall be signed by a person having the authority to guarantee the statement.

1.2 SUMMARY

A. General Work Description

1. Building Management System (BMS) controls contractor shall provide:

a. A fully integrated expansion to the existing **Johnson Controls Branch Office Metasys Extended Architecture** ~~Johnson Metasys b~~**B**uilding ~~m~~**M**anagement ~~s~~**S**ystem (BMS). All new components shall be UL-listed and incorporate direct digital control (DDC) for energy management, equipment monitoring, and HVAC control.

b. Electronic sensors.

c. Actuators of terminal equipment valves and dampers shall be electric. All sensors shall be electric/electronic.

d. Actuators for valves and dampers located within the MER's shall be electric.

e. All line voltage and low voltage wiring, conduit, panels, and accessories for a complete operational system. All final electrical connections to each stand-alone DDC Controller.

f. BMS Contractor shall be responsible for all electrical work associated with the BMS and as shown in the contract documents. The BMS contractor shall be responsible for all electrical work associated with any BMS interface to any other systems including but not limited to HVAC and plumbing systems.

g. The BMS contractor shall furnish all wells for water monitoring devices, flow switches, and alarms.

h. A complete operational system including all work required for a completely operational system as defined in the entire set of drawings and specifications, including but not limited to associated specifications for mechanical and electrical work, all contract drawings, BMS Point List, and remote function schedule.

i. The BMS system as a whole shall have the capability to be easily expanded through the addition of point modules and/or controllers. No equipment shall be installed which cannot, as installed, accommodate an upgrade the entire system by at least 25%. A 25% system upgrade shall include 25% more points (of each type) either via point modules or controllers and 25% more memory capacity for future connections.

j. Provide appropriate labor jurisdiction to mount, wire and pipe airflow measuring stations in the field. Provide manpower as required to meet project schedule.

1.3 DEFINITIONS

A. AI - Analog Input

B. ANSI - American National Standards Institute

C. AO - Analog Output

D. ASCII - American Standard Code for Information Interchange

E. AWG - American Wire Gauge

F. BMS - Building Management System

G. CPU - Central Processing Unit

H. CRT - Cathode Ray Tube

I. DAC - Digital to Analog Converter

J. DDC - Direct Digital Control

K. DI - Digital Input

L. DO - Digital Output

M. EEPROM Electronically Erasable Programmable Read Only Memory

N. EMI - Electromagnetic Interference

O. FAS - Fire Alarm Detection and Annunciation System

P. HOA - Hand-Off-Auto

Q. IEEE - Institute of Electrical and Electronics Engineers

R. I/O - Input/Output

S. LAN - Local Area Network

T. LCD - Liquid Crystal Display

U. LED - Light Emitting Diode

V. MCC - Motor Control Center

W. NC - Normally Closed

X. NO - Normally Open

Y. OWS - Operator Workstation

Z. OAT - Outdoor Air Temperature

AA. PC - Personal Computer

BB. RAM - Random Access Memory

CC. RFI - Radio Frequency Interference

DD. RH - Relative Humidity

EE. ROM - Read Only Memory

FF. RTD - Resistance Temperature Detector

GG. TCP/IP- Transmission Control Protocol/Internet Protocol

HH. UPS - Uninterruptible Power Supply

II. VAC - Volts, Alternating Current

JJ. VAV - Variable Air Volume

KK. VDC - Volts, Direct Current

LL. WAN - Wide Area Network

1.4 SYSTEM DESCRIPTION

A. General Product Description

1. The building management system (BMS) shall integrate multiple building functions including equipment supervision and control, alarm management, energy management and historical data collection.

2. The building management system shall consist of the following:

a. Independent, Primary Control Panels (PCPs) for global control strategies, system wide DDC commands, alarm management, data accumulation, etc. The intent of this specification is that the loss of any one Primary Control Panel shall affect only the points and/or network connected to that specific Primary Control Panel and shall not affect the operation of any other Primary Control Panels.

b. Fully programmable, stand-alone, Secondary Control Panels for control of each air handler, each AC unit, each pumping system, and each hot and chilled water system. Application specific terminal equipment controllers shall control all terminal equipment such as FP VAV, etc. Motors shall be controlled only from Secondary Control Panel associated with the respective HVAC system.

c. Portable operator's terminals (POTs) to be connected and communicating simultaneously with the entire Primary Network from any Primary Control Panel or any remote portable operator terminal connection jack, as specified. The portable operators terminals shall be able to simultaneously monitor, adjust, trend, edit, modify, add, delete, backup the entire B.M.S system (including Secondary Control Panels, Primary Control Panels, etc.) point database and all programs.

3. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, Primary Control Panels, Secondary Control Panels and operator devices.

4. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each Primary Control Panel shall operate independently by performing its own specified control, alarm management, operator I/O and data collection. The failure of any single component or network connection (including a wire break) shall affect only the system controlled by the specific PCP and shall not interrupt the operation of any other SCP, PCP, etc. In addition, the failure shall not affect or interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

5. Primary Control Panels shall be able to access any data from, or send control commands and alarm reports directly to, any other Primary Control Panels or combination of Primary Control Panels on the network without dependence upon a central or intermediate processing device. Primary Control Panels shall also be able to send alarm reports to multiple operator workstations without dependence upon a central or intermediate processing device.

6. Operators shall be able to assign password access and control priorities to each HVAC system or interfaced system individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control only the system that the operator is authorized for. All other systems shall not be displayed at the PC workstation or portable terminal. Passwords and priority levels for every system shall be fully programmable and adjustable. This provision shall be applicable to all systems accessed either locally or remotely.

1.5 SEQUENCE OF OPERATION

A. Refer to Section 23 09 93 for Sequence of Operations for HVAC Controls.

1.6 SUBMITTALS

A. General

1. Indicate at the beginning of each submittal, all substitutions and deviations from requirements of Contract Documents.

B. Product Data

1. Technical bulletins and catalog data for all equipment and system components. Clearly identify, by use of symbol or tag number, the service of each item. All irrelevant information shall be marked out leaving only pertinent data.

C. Shop Drawings

1. Shop drawing submittals shall comply with Division 01 and other specified requirements and shall include sufficient data to indicate complete compliance with Contract Documents. Submission shall be in the form of drawings, brochures, bulletins, catalog data and/or narrative descriptions.

2. Submission shall include, but not be limited to:

   a. Symbol and abbreviation lists.

   b. System block diagram showing quantity and location of personal operator workstation(s), Primary Control Panels, Secondary Control Panels, and locations of power feeds to BMS and other major system components.

   c. Control diagrams for all systems controlled. Controls shall be shown on system flow diagrams.

   d. Power wiring diagrams and electrical requirements.

   e. Interfaces (software and hardware) with other equipment provided in other sections of specifications including but not limited to chiller control system.

   f. Narrative description of operation for each system, enumerating and describing the function of each component. Include alarm and emergency sequences, and equipment interlocks.

   g. Description of manual override operation for every input and output point.

   h. Complete input/output point schedule. Identify point function, type and location.

   i. Spare capacity provisions.

   j. Detailed bill of materials.

   k. Valve and damper schedule: Provide identification numbers, location, system, dimensions and performance data. Include damper leakage rates.

   l. Device mounting details. Include as a minimum:

      (i) Sensing elements in ducts and casings.

      (ii) Sensing elements in piping.

   m. Ladder wiring diagrams.

   n. Other information as requested herein.

   o. Complete full size drawings, 11" x 17" minimum.

D. Programming

   1. Point identification code.

   2. System advisory messages, printouts, logging formats.

3. Drawings of system graphics showing monitored points. (Include only if graphics are specified elsewhere in this specification).

4. Software flow-charts for applications and DDC programs.

5. Person machine interface program, including commands, alarm annunciation, logs and programming capabilities.

6. Description of system operation under failure conditions.

E. Samples

1. All wall, pipe and duct sensors.

2. All other devices mounted on finished surfaces.

3. Valve, damper, panel and sensor tags.

F. Quality Control Submittals

1. UL, FM, CSA listing compliance certificates.

2. Final calibration, commissioning and testing reports.

G. Time Requirements

1. Within thirty (30) days of award of contract manufacturer shall provide schedule of all submittals employing format as provided hereinafter and enumerating all drawings, samples and miscellaneous submittals by name, quantity, etc.

1.7 QUALITY ASSURANCE

A. System must be designed, furnished, and installed by a **Johnson Controls Branch Office to maintain compatibility with the existing building management system.** ~~contractor that is certified by Johnson Controls, Inc. for installation of Metasys System and can modify existing programming to incorporate the work of this project.~~

B. All portions of the system must be of the same manufacturer and must be designed, furnished, installed, commissioned and serviced by manufacturer employed, factory trained employees. Systems proposed by distributors, manufacturer's representatives, and/or independent contractors shall not be considered and are not acceptable.

C. Single source responsibility of supplier shall be the complete installation and proper operation of the BMS and control system and shall include debugging and proper calibration of each component in the entire system.

D. Supplier shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.

E. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Section 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

F. BMS shall comply with UL 916 PAZX and 864 UDTZ and be so listed at the time of bid.

G. System devices shall have UL 864 (UUKL smoke control) and shall be so certified at time of bid.

H. All system components shall be fault-tolerant. System shall include:

1. Satisfactory operation without damage at 110% and 85% of rated voltage and at plus 3 Hertz variation in line frequency.

2. Static, transient and short-circuit protection on all inputs and outputs.

3. Protection for communication lines against incorrect wiring, static transients and induced magnetic interference.

4. Network-connected devices to be AC coupled or equivalent so that any single device failure will not disrupt or halt network communication.

5. All real time clocks and data file RAM to be battery-backed for a minimum 72 hours and include local and remote system low battery indication.

I. The Bidder shall be regularly engaged in the manufacturing, installation and maintenance of BMS systems and shall meet the following qualifications.

1. A minimum of ten (10) years of demonstrated technical expertise and experience in the manufacture, installation and maintenance of BMS systems similar in size and complexity to this project.

2. A maintained service organization consisting of at least ten (10) competent servicemen, within 50 miles of the project site, for a period of not less than ten years.

3. The Bidder shall not be considered qualified to bid this project unless they can provide a list of 10 projects, similar in size and scope to this project, completed within the last five years.

J. The system manufacturer/installer shall provide a full-time, experienced project manager for this work from beginning of control installation until final completion. The project manager responsible for direct supervision of the design, installation, start-up and commissioning of the BMS as well as attending of project meetings whenever directed by the owner, construction manager, and/or mechanical contractor. It shall not be acceptable to change the project manager after the project has begun and before final completion.

K. Comply with all current governing codes, ordinances, and regulations including UL, NFPA, the local Building Code, NEC, etc.

L. The manufacturer of the building management system shall provide documentation supporting compliance with ISO-9002 (model for Quality Assurance in Production, Installation and Servicing). The intent of this specification requirement is to ensure that the products and services that the manufacturer and installer provide are delivered through a Quality System and Framework that will assure consistent quality throughout the project.

M. The system shall have a documented history of compatibility by design for a minimum of 15 years. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability for any existing control system component including but not limited to Primary Control Panels, Secondary Control Panels, personal operator workstations, and portable operator's terminals, to be connected and directly communicate with any new BMS system equipment without bridges, routers or protocol converters.

N. In order to ensure the availability of rapid response, the BMS Contractor shall have a local facility or authorized service agent within a 50-mile radius of the job site. On-site emergency service shall be available on a 24-hour, 7-day-a-week basis.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.10 COORDINATION

A. Coordinate location of thermostats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Division 26 Section "Fire Alarm" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

D. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

E. Coordinate equipment with Division 26 to achieve compatibility with motor starters and annunciation devices.

1.11 EXTRA MATERIALS

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

B. Replacement Materials: Provide one replacement component for each unique control device including as a minimum:

1. Panels:

a. DDC panel board components.

b. Relays.

c. Power supplies and transformers.

2. Field input devices:

a. Space, air and water temperature sensors.

b. Space and air humidity sensors.

c. Air and water differential pressure transmitters.

d. Static pressure transmitter.

e. Air and water differential switch.

f. Freezestat

g. Current switches.

3. Field output devices:

a. Actuators for dampers and valves excluding butterfly valves.

b. Electric-pneumatic transducers or switches.

C. Maintenance Materials: Any unique or special tools that are required for proper operation, maintenance and repair as outlined in the system operation, maintenance and repair manuals shall be provided.

D. Provide a complete list of replacement and maintenance materials in the technical proposal.

1.12 RECORD DOCUMENTS

A. Owner's Manual General

1. Submit two (2) draft copies of owner's manuals for review. After review by authorized representative, the contractor shall incorporate review comments and shall submit four (4) interim final copies. Upon completion of project, acceptance of project by the owner, submit six (6) copies of final "as built" manuals and one (1) reproducible copy (3-mil sepia Mylar).

2. Update manuals with modifications made to system during guarantee period. Provide replacement pages or supplements in quantity stated above for "as built" manuals.

3. Assemble owner's manuals into multi-volume sets.

4. Protect each volume with a heavy-duty vinyl plastic binder. Volumes to have plastic printed dividers between major sections and have oversized binders to accommodate up to 4 inch thick set of additional information.

5. Each binder to be silk screened with project name and volume title on front cover and binder.

6. On the first page of each manual identify with project name, title, owner's name, engineer's name, contractor's name, address and service phone number, and person who prepared manual.

B. Provide an operating manual to serve as training and reference manual for all aspects of day-to-day operation of the system. Include as a minimum:

1. Control flow diagrams for all building systems.

2. Sequence of operation for automatic and manual operating modes for all building systems. The sequences shall cross-reference the system point names.

3. Description of manual override operation of all control points in system.

4. BMS system manufacturer's complete operating manuals.

C. Provide a maintenance manual to serve as training and reference manual for all aspects of day-to-day maintenance and major system repairs. Include as a minimum:

1. Complete as-built installation drawings for each building system.

2. Overall system electrical power supply scheme indicating source of electrical power for each system component. Indicate all battery backup provisions.

3. Overall system shielding and grounding scheme indicating all major components and ground paths.

4. Drawings showing installation details and locations of equipment.

5. Charts showing normal operating conditions at significant points such as electrical test points.

6. Routine preventive maintenance procedures, corrective diagnostics troubleshooting procedures, and calibration procedures.

7. Parts lists with manufacturer's catalog numbers and ordering information.

8. Lists of ordinary and special tools, operating materials supplies and test equipment recommended for operation and servicing.

9. Manufacturer's operating, set up, maintenance and catalog literature for each piece of equipment.

10. Maintenance and repair instructions.

11. Recommended spare parts.

12. Field test reports.

D. Provide a programming manual to serve as training and reference manual for all aspects of system programming. Include as a minimum include the following:

1. Complete programming manuals and reference guides.

2. Details of any special software packages and compilers supplied with system.

3. Information required for independent programming of system.

4. Point schedule including all points, real and pseudo.

5. Project specific software troubleshooting procedures.

E. Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals in accordance with Section 01 00 00, General Requirements.

a. Prepare data in the form of an instructional manual.

b. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, in three parts as follows:

(i) Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.

(ii) Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

(a) Significant design criteria.

(b) List of equipment.

(c) Parts list for each component.

(d) Operating instructions.

(e) Maintenance instructions for equipment and systems.

(iii) Part 3: Project documents and certificates, including the following:

(a) Shop drawings and product data.

(b) Certificates.

(c) Photocopies of warranties.

(d) Photocopies of bonds.

2. Contents, Each Volume

a. Table of Contents: Provide title of project; names, addresses, and telephone numbers of Architect/Engineer, Sub-consultants and contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

b. For each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

c. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

d. Drawings: Supplement product data to illustrate relations of components parts of equipment and systems, to show control, flow and wiring diagrams. Do not use Project Record Documents as maintenance drawings.

e. Narrative Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

f. Warranties.

g. Bonds.

3. Manual for Equipment and Systems

a. Each item of equipment and each system: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

b. Panelboard Circuit Directories: provide electrical service characteristics, controls, and communications.

c. Include color-coded wiring diagrams as installed.

d. Operating Procedures: Include start-up, break-in and routine normal operating instructions and sequences. Include regulation, control stopping, shutdown and emergency instructions. Include summer, winter, and any special operating instructions.

e. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting, disassembly repair, and re-assembly instructions; and alignment, adjusting, balancing, and checking instructions.

f. Provide servicing and lubrication schedule for dampers and actuators and list of lubricants required.

g. Include manufacturers printed operation and maintenance instructions.

h. Include sequence of operation by BMS manufacturer.

i. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required.

j. Provide control diagrams by controls manufacturer as installed.

k. Provide BMS contractor's coordination drawings, with color coded control piping diagrams as installed.

l. Provide list of original manufacturers' spare parts, current prices, and recommended quantities to be maintained in storage.

m. Additional requirements as specified in individual Product specification sections.

n. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

4. Instruction of Designated Facility Personnel

a. Before final inspection, instruct Owner's designated personnel in operation, adjustment and maintenance of products, equipment, and systems, at agreed upon times.

b. For equipment requiring seasonal operation, perform instruction for other seasons within six months.

c. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

d. Prepare and insert additional data in Operation and Maintenance manual when need for such data becomes apparent during instruction.

5. After all final tests and adjustments have been completed, fully instruct the proper Owner's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.

6. Furnish required number of manuals, in bound form containing data covering capacities, maintenance and operation of all equipment and apparatus. Operating instruction shall cover all phases of control and include the following:

    a. Lubrication Schedule: Indicating type and frequency of lubrication required for dampers and actuators.

    b. List of Spares: Recommended for normal service requirements.

    c. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.

    d. Instruction Books may be standard booklets but shall be clearly marked to indicate applicable equipment.

    e. Wiring Diagrams: Generalized diagrams are not acceptable, submittal shall be specifically prepared for this Project.

7. Instruct Owner on the maintenance instructions for draining and protecting chilled water coils in the winter.

F. Display of Maintenance Instructions

1. One set of operating and maintenance instructions shall be neatly framed behind glass and hung adjacent to the equipment concerned.

G. Record Drawings

1. The BMS contractor shall provide a complete set of "as-built" or record drawings. The drawings shall be prepared and delivered to the architect in an acceptable AutoCAD format.

2. The drawings shall indicate:

    a. All BMS work installed exactly in accordance with the original design.

    b. All BMS work installed as a modification or addition to the original design.

    c. The dimensional information necessary to delineate the exact location of all wiring runs that are so concealed as to be untraceable by inspection through the regular means of access established for inspection and maintenance. Where shop drawings have been prepared and approved, the "as-built" drawings shall be cross-referenced to the respective shop drawing.

    d. All wiring routing locations must be shown.

3. As-built record drawings shall include the updating of all equipment schedule sheets.

4. The record drawings shall be reproducible as directed.

5. The BMS Contractor shall make arrangements with the Engineer to obtain design drawings on CD ROM disks in AutoCAD format for use as a basis for the "as-built" drawings. These documents remain the property of Cosentini Associates and shall not be used for any other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings.

6. Prior to developing any "as-built" drawings, the contractor shall coordinate with the Owner and the Architect Engineer the drawing layers, etc., of the CAD drawings.

7. "As-built" information shall be submitted as follows:

   a. CAD drawing files on CD ROM disks in AutoCAD format. The version of AutoCAD to be utilized shall be the version in use by the Engineer at the time of the submission.

   b. Two (2) sets of reproducible drawings.

   c. Three (3) sets of blueprints.

8. The quantity of design drawings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required "as-built" information.

9. Progress prints of record drawings shall be submitted monthly during the construction period for Architect's approval.

10. This trade shall submit the "as-built" set for approval by the building department in a form acceptable to the department, when required by the jurisdiction.

11. The contractor shall provide files on disks in an ASCII format for all schedules, catalog information, installation instructions manuals (information) indexed by system and/or equipment.

12. All equipment and systems require proper identification and tagging, including a system description. This information must be coordinated with all design and shop drawings.

1.13 WARRANTY

A. The Contractor shall warranty the BMS to be free from defects in workmanship and material for a period of one (1) year from the date of acceptance by the Owner. During the warranty period, the Contractor shall furnish all labor to repair or replace all items or components that fail due to defects in workmanship or material. This contractor shall also provide all system software upgrades during the warranty period.

B. The Contractor shall provide an on-line troubleshooting service during the warranty period. The on-line system shall allow the contractor or owner's agent the ability to interrogate, troubleshoot and correct warranty defects remotely. This system shall be operational 24 hours a day, 365 days a year. If the local manufacturer's staff cannot resolve the problem, the corporate home office staff shall remotely connect to the system and troubleshoot the warranty defect.

C. The Contractor shall submit a written report within 3 days of all warranty defects, the action taken, and corrections made for each warranty call.

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 the following:

1. Electric, Electronic, and DDC Systems:

a. Johnson Controls **Branch Office Metasys Extended Architecture** ~~Inc.; Metasys~~.

2.2 SYSTEM ARCHITECTURE

A. The Building Management System (BMS) is designed to support the comfort, safety, and productivity of the building's occupants and property. BMS shall integrate multiple building functions including equipment supervision and control, alarm management, energy management, information management, and historical data collection and archiving.

B. The BMS shall use an open architecture and fully support a multi-vendor environment to match that of the existing BMS.

C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, network controllers and operator devices, while re-using existing controls equipment.

2.3 OPERATOR INTERFACE

A. Personal Computer Operator Workstation Software

1. General

a. Provide software and graphics update/expansion which includes the following:

(i) Scheduling and override of building operations.

(ii) Collection and analysis of historical data.

(iii) Editing, programming, storage and downloading of controller databases, programs, and parameters.

b. Software shall allow the operator to perform commands including, but not limited to:

(i) Start up and shutdown of equipment.

(ii) Setpoint adjustment.

(iii) Add/modify/delete time programming.

(iv) Enable/disable process execution.

(v) Lock/unlock alarm reporting.

(vi) Enable/disable totalization and/or trending.

(vii) Override PID loop setpoints.

(viii) Enter temporary override schedules.

(ix) Define holiday schedules.

(x) Change time/date.

2. Reporting

a. As a minimum, the system shall allow the user to easily obtain the following types of reports:

(i) A general listing of all points in the network

(ii) List of all points currently in alarm

(iii) List of all points currently in override status

(iv) List of all disabled points

(v) List of all points currently locked out

(vi) DDC Controller trend overflow warning

(vii) List all weekly schedules

3. Scheduling

a. Provide a graphical spreadsheet-type format for simplification of time-of-day scheduling and overrides of building operations. Provide schedules for 365 days in advance.

b. Weekly schedules shall be provided for each building zone or piece of equipment with a specific occupancy schedule. Temporary overrides and associated times may be inserted into blocks for modified operating schedules. After overrides have been executed, the original schedule will automatically be restored.

c. Zone schedules shall be provided for each building zone as previously described. Each schedule shall include all commandable points residing within the zone. Each point may have a unique schedule of operation relative to the zone's occupancy schedule, allowing for sequential starting and control of equipment within the zone. Scheduling and rescheduling of points may be accomplished easily via the zone schedule graphic.

4. Collection and Analysis of Historical Data

a. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or changes of value, both of which shall be user-definable. Trend data shall be stored on hard disk for future diagnostics and reporting.

b. Trend data report graphics shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or pre-defined groups of at least 6 points. Provide additional functionality to allow any trended data to be transferred directly to an off-the-shelf spreadsheet package such as Excel. This shall allow the user to perform custom calculations such as energy usage, equipment efficiency and energy costs and shall allow for generation of these reports on high-quality plots, graphs and charts.

c. Provide additional functionality that allows the user to view trended data on trend graph displays. Displays shall be actual plots of both historical and/or real-time dynamic point data. A minimum of 10 points shall be viewed simultaneously on a single graph. The user may pause the graph and take "snapshots" of screens to be stored on the hard disk for future recall and analysis. Displays shall include an 'X' axis indicating elapsed time and a 'Y' axis indicating a range scale in engineering units for each point. The 'Y' axis shall have the ability to be manually or automatically scaled at the user's option. Different ranges for each point may be used with minimum and maximum values listed at the bottom and top of the 'Y' axis. All 'Y' axis data shall be color-coded to match the line color for the corresponding point.

(i) Static graphs shall represent actual point data that has been trended and stored on disk. Exact point values may be viewed on a data window by pointing or scrolling to the place of interest along the graph. Provide capability to print any graph on the system printer for use as a building management and diagnostics tool.

(ii) Dynamic graphs shall represent real-time point data. Any point or group of points may be graphed, regardless of whether they have been predefined for trending. The graphs shall continuously update point values. At any time the user may redefine sampling times or range scales for any point. In addition, the user may pause the graph and take "snapshots" of screens to be stored on the workstation disk for future recall and analysis. As with static graphs, exact point values may be viewed and the graphs may be printed.

## 2.5 SECONDARY CONTROLLER

A. Secondary Control Panel Hardware

1. Each Secondary Control Panel shall operate as a stand-alone controller capable of performing its user selectable control routines independently of any other controller in the system. Each secondary control panel shall be a microprocessor-based, multi-tasking, real-time digital control processor.

2. Provide a Secondary Control Panel for each of the following types of equipment (if applicable):

   a. Air Handling Unit

   b. Constant Air Volume (CAV) boxes

   c. Duct-mounted reheat coils

   d. Fan-Powered Variable Air Volume (VAV) Boxes

   e. Reheat Coils

   f. Supplemental AC units

   g. Variable Air Volume (VAV) Boxes

   h. Chilled Water Pumps

   i. Hot Water Pumps

   j. Hot Water Converter

3. Each Secondary Control Panel shall, at a minimum, be provided with:

   a. Appropriate NEMA rated enclosure.

   b. A stand-alone real-time digital control microprocessor module.

   c. Secondary network communications ability.

   d. Power supplies as required for all associated modules, sensors, actuators, etc.

e. Input/output points as required.

f. Software as required for all sequences of operation, logic sequences and energy management routines. Relay logic is not acceptable.

g. Auxiliary enclosure for analog output transducers, isolation relays, etc. Auxiliary enclosure shall be part of primary enclosure or mounted adjacent primary enclosure.

h. Each controller measuring air volume shall include a differential pressure transducer.

i. SCR control of electric heaters.

j. Fan speed controller for fan powered VAV boxes

k. Fan relay for fan powered VAV boxes and fan coil units

4. Each Secondary Control Panel shall continuously perform self-diagnostics on all hardware and secondary network communications. The Secondary Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failure to establish communication to the system.

5. Provide each secondary control panel with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM, or a minimum of 72-hour battery backup shall be provided. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration. Provide uninterruptible power supplies (UPSs) of sufficient capacities for all terminal controllers that do not meet this protection requirement. Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.

6. The secondary control panels shall be powered from a 24 VAC source provided by this contractor and shall function normally under an operating range of +/- 10%, allowing for power source fluctuations and voltage drops. The controllers shall also function normally under ambient conditions of 32 to 122 F (0 to 50 C) and 10% to 90% RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the intelligence board assembly.

B. Secondary Control Panel Software

1. Provide all necessary software for a complete operating system as required. All software shall reside in each Secondary Control Panel. Secondary Control Panels shall not be dependent upon any higher level computer or another controller for operation.

2. Each secondary controller shall perform its primary control function independent of primary controller LAN communication, or if LAN communication is interrupted. Reversion to a fail-safe mode of operation during LAN interruption is not acceptable. The controller shall receive its real-time data from the primary control panel time clock to insure LAN continuity. Each controller shall include algorithms incorporating proportional and integral (PI) control for all applications. All PI parameters shall be field-adjustable by the user via a portable operator's terminal.

3. Secondary control panels shall support pressure independent terminal boxes including VAV cooling only, VAV with hot water or electric reheat, Fan-powered VAV and Fan-powered VAV with hot water or electric reheat. All VAV box control applications shall be field-selectable such that a single controller may be used in conjunction with any of the above types of terminal units to perform the specified sequences of control. This requirement must be met in order to allow for future design and application changes and to facilitate system expansions. Controllers that require factory application changes are not acceptable.

2.6 INPUT DEVICES

A. General

1. All devices and equipment shall be approved for installation.

2. Provide the following field devices as required by the monitoring, control and optimization functions listed elsewhere in this specification.

3. All sensor signals shall be via a 4-20 ma loop.

B. Analog Inputs

1. Temperature Sensors (Not Including Space Temperature Sensors)

a. All temperature sensors shall use RTD (Resistance Temperature Detector) elements. All control signals shall be via a 4-20 ma loop.

b. Calibration adjustments: Zero & Span.

c. Any point, physical or calculated may be designated for trending.

d. Provide Minco or equal.

e. Range:

| | |
|---|---|
| Liquid Immersion Temperature | +20/+120 F, +70/+220 F |
| Duct (Single Point) Temperature | +20/+120 F, +70/+220 F |
| Duct (Averaging) Temperature | +20/+120 F |
| Outside Air Temperature | -50/+122 F |

2. Space Temperature Sensors

   a. RTD or thermistor type

   b. Accuracy: +0.5 F

   c. Operating Range: 80 Degree Range Maximum

   d. Setpoint Adjustment Range: 55 to 95 F

   e. Shall include a terminal jack integral to the sensor assembly to allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.

   f. Concealed setpoint adjustment switch with software limits.

   g. Push-button override switch. The override switch may be locked out, overridden, or limited as to time through software by an authorized operator.

   h. Room sensors shall not be located on outside walls.

   i. The length of wiring from the space temperature sensor to the controller shall not exceed 100 ft.

3. Water Differential Pressure Sensor

   a. Provide industrial grade sensors for all differential pressure bypass valves.

   b. Factory calibrated for operating range.

   c. Rated for system pressure.

   d. Manufacturers standard 316 stainless steel.

   e. 3 valve manifold and pressure gauges for supply and return pressures.

   f. Output shall be 4-20 ma.

   g. Rosemount 1151DP, with 316 stainless steel or approved equal.

4. Differential Pressure Transmitter

   a. Sensor

      Accuracy: 5% at 400 to 4000 FPM ( 2 to 20.4 m/s)

      Range: 0 to 4000 FPM (0 to 20.4 m/s)

5. Static Pressure Sensor

   a. Accuracy: 1% full scale.

b. Transmitter: 4-20mA.

c. Range shall be as required by application.

d. Provide Setra or equal.

6. Airflow Measuring Stations

a. Station

(i) Airflow measuring stations required to accomplish the specified control sequence shall be furnished under this section but installed under the sheet metal section. Airflow measuring stations shall be of heavy gauge metal construction, and shall be furnished with an air straightening section with an open face area of not less than 97%.

(ii) Each airflow measuring station shall measure airflow by means of a network of static and total pressure sensors factory positioned and connected in parallel to produce an averaged velocity pressure. The measured velocity pressure converted to airflow (CFM) shall have an accuracy of 2% of the full scale throughout the velocity range from 700 to 4,000 FPM when measured under ideal laboratory conditions. The location of stations shall meet manufacturer's guidelines.

(iii) The maximum resistance to airflow shall not exceed 0.6 times the velocity head. The unit shall be suitable to withstand temperatures up to 250F.

(iv) All interconnecting tubing between the air measuring and any remote metering or control shall be furnished and installed by the supplier of the station. A minimum of one static and one total pressure sensor shall be used for every 16 sq. inches of duct cross sectional area for ducts up to four sq.ft. in cross section. For larger ducts, a minimum of one static and one total pressure sensor shall be used for every 36 sq. inches of duct cross sectional area.

(v) Interconnecting sensor manifolds shall equalize and relate each type of sensor measurement into one total pressure and one static pressure metering port. The permanent system pressure loss created by the unit shall not exceed .15 of a velocity head. Each airflow measuring station shall consist of 16-gauge sheet metal casing and an air straightening section with an open face area not less than 97%. The sheet metal contractor shall install air measuring stations.

(vi) Provide Air Monitor Fan-E or equal with an accuracy of + 2%, a turndown of 6 to 1, and no pressure loss across the station.

(vii) Final locations to be coordinated with sheet-metal contractor and manufacturer to ensure installed actual accuracy meets specifications.

b. Velocity Pressure Sensor For Airflow Measuring Stations

(i) Range: 0.1 to 0.5"wg (Size based on ABMS Output).

(ii) Accuracy: + 0.25" W.G.

(iii) Transmitter: 4 – 20 ma.

7. Flow Meters

a. Provide insertion type, turbine flow meters designed to mount through a fully open, 1 inch full bore ball valve supplied by flow meter manufacturer. Meter flow range shall be 2-40 feet/second for liquid service. Meter linearity shall be +/-1% for a 10:1 range. Repeatability shall be 0.10%. Turbine head and stem shall be constructed of stainless steel, bearings shall be tungsten carbide, and housing and flange shall be carbon steel. Housing pressure rating shall be 350 PSI. A D.C. powered, two-wire transmitter shall be mounted on the flow meter. The flow transmitter output shall be a 4-20 madc signal that is linear with flow. Transmitter input shall be from magnetic pickup. Transmitter accuracy shall be 0.25% of span.

b. Provide an isolation valve kit for turbine flow meters, including isolation valve, bypass valve, nipple, etc., to allow service and removal under pressure and while system is operating.

c. Turbine meter shall be Onicon F 1220 or equal.

8. Outside Air Volume Sensor/Controller

a. Provide an outside airflow measuring and control system utilizing DDC controls as required by the plans and specifications. System shall be designed to provide accurate measurement without upstream and downstream ductwork.

b. Outside airflow measuring and control system shall have a velocity range from 45 ft/min to 6000 ft/min with a minimum accuracy of 5.0%. Each sensor in the array shall be independently processed for velocity value.

c. Provide 0-10 VDC or 4-20 ma signal proportional to velocity to Control Panel. Control Panel shall modulate damper to maintain setpoint.

d. Provide Dybec, Ruskin or equal.

C. Binary Inputs

1. Water Differential Pressure Switches

a. Range:8 to 70 PSI

b. Differential: 3 PSI

c. Maximum differential pressure: 200 PSI

d. Maximum pressure: 325 PSI

e. Provide Mercoid or equal

f. Shall be used for all pump status specified in the point schedule.

2. Air Differential Pressure Switches

a. Diaphragm type.

b. Die-cast aluminum housing.

c. Adjustable setpoint.

d. Switch rating shall be a minimum of 5 amps at 120 VAC.

e. Switches shall be SPDT.

f. The switch pressure range shall be suited for the application.

g. Provide Dwyer or equal.

3. Freezestats

a. Furnish and install, for each air handling unit with outdoor air connections, a low temperature safety thermostat (freezestat) with a 20 ft. sensing element.

b. There shall be one freezestat per coil section.

c. Element shall be installed in a serpentine fashion across the inlet of the cooling coil in the air stream.

d. Element shall be arranged to stop the unit supply fan and its associated return air fan should the temperature at any point along the sensing element fall below 35oF for an adjustable time period.

e. Low temperature detector shall be automatic reset, DPDT type.

f. Provide manual reset button at primary control panel and time delay relay to lockout fan if freeze condition exists for more than 60 seconds. Time delay relay shall be adjustable up to 5 minutes.

4. Current Sensing Relay

a. Provide and install current sensing relays for all motor status points 5HP and greater. Sensor shall be split core, two wire, loop powered and sized for expected amperage. Unit shall be UL listed. Provide status LEDs for current sensed below setpoint, current sensed above setpoint and loop power failure. The unit shall automatically range itself and have solid state outputs.

2.7 OUTPUT DEVICES

A. General

1. All devices and equipment shall be approved for installation.

2. Provide the following field devices as required by the monitoring, control and optimization functions listed elsewhere in this specification.

B. Actuation

1. Electric Only

a. All valve and damper actuation shall be electric.

2. Incremental Electronic Actuator for Terminal Equipment Valve and/or Damper Actuation

a. Incremental actuators shall be allowed for terminal equipment only.

b. Actuators shall be proportional, electronic, direct-coupled actuators used for modulating service. Actuators shall be equipped with metal housings and visual stroke indicators.

c. Actuators shall be equipped with a permanent manual adjustment.

d. Minimum Torque: 35 in-lb.

e. Operating Voltage: 24 VAC.

f. Input Signal: 3 wire floating, 0 – 10 VDC, or 4 – 20 ma.

g. Frequency: 50, 60 Hz.

h. Power Consumption: 1.5va maximum.

i. Spring Return Time: 20 seconds maximum.

j. Nominal Force: 90 lb. Minimum.

k. Stroke: 7/32" (5.5 mm) maximum.

l. For use when the maximum media temperature is 230° F.

3. Valve Actuation

a. All valve actuators shall be sized to close against a differential pressure greater than 125% of the design pump head. Where pressure and flow combinations exceed ratings for commercial valves and actuators, industrial class valves and actuators shall be provided.

b. Valve actuators shall provide smooth modulation at design flow and pressure conditions.

c. Valve actuators shall fail-safe in either the normally open or normally closed position in the event of power failure, signal failure or compressed air failure. Fail Safe Positions are as follows:

| | | |
|---|---|---|
| (i) | Air-Handling Unit Preheat Valves | Normally Open |
| (ii) | Air-Handling Unit Cooling Valves | Normally Closed |
| (iii) | Duct-mounted Reheat Coil Valves | Normally Closed |
| (iv) | Radiation Valves | Normally Open |
| (v) | Cabinet Unit Heater Valves | Normally Open |

d. Electronic Modulating Actuator for Valves 2" and Smaller

(i) Actuator shall have electronic, proportional control and shall be direct-coupled with spring return.

(ii) Actuators shall be equipped with a clutch release for manual override and visual and electronic stroke indicators.

(iii) Operating Voltage: 24 VAC.

(iv) Input Signal: 4 - 20 ma.

(v) Power Consumption: 18 VA maximum.

(vi) Spring Return Time: 15 seconds maximum.

(vii) Nominal Force: 225 lb. Minimum.

(viii) Stroke: 3/4" (20 mm) maximum.

(ix) For use when the maximum media temperature is 300 F.

e. Electronic Modulating Actuator for Valves 2-1/2" and Larger

(i) Actuator shall have electronic, proportional control and shall be direct-coupled with spring return.

(ii) Actuators shall be equipped with a clutch release for manual override and visual and electronic stroke indicators.

(iii) Operating Voltage: 24 VAC.

(iv) Input Signal: 4 - 20 ma.

(v) Power Consumption: 28va maximum.

(vi) Spring Return Time: 20 seconds maximum.

(vii) Nominal Force: 610 lb.

(viii) Stroke: 1-1/2" (40 mm) maximum.

(ix) For use when the maximum media temperature is 300° F.

4. Damper Actuation

a. Damper actuators shall have external adjustable stops to limit the stroke in either direction.

b. All damper actuators shall have sufficient power to overcome friction of damper linkage and air pressure acting on louvers and to operate the damper smoothly throughout the entire damper range.

c. Actuators shall be sized with a torque greater than 150% of the design damper torque.

d. Actuators shall have mounting arrangement for location outside of the air stream. The damper actuators shall be mounted on the damper extension so that it is not burned in the wall construction.

e. Damper actuators shall fail-safe in either the normally open or normally closed position in the event of power failure, signal failure or compressed air failure. Fail Safe Positions are as follows:

| | | |
|---|---|---|
| (i) | Outside Air Dampers | Normally Closed |
| (ii) | Return Air Dampers | Normally Opened |
| (iii) | Exhaust Air Dampers | Normally Closed |
| (iv) | F/SM, SM Dampers | Normally Closed |

f. Electric Damper Actuation for Modulating and Two Position Damper Actuation

(i) Provide proportional, electronic, direct-coupled spring return actuators for all automatic dampers used for modulating service. Each actuator shall be equipped with a brushless DC motor, self centering shaft coupling, metal housing, permanent manual override, visual stroke indicators, built in adjustable start and span controls, and shall be sized to operate the damper with a torque greater than 150% of the design damper torque. Provide actuators with the following specifications:

| | | |
|---|---|---|
| (a) | Operating Voltage: | 24 VAC |
| (b) | Input Signal:<br>on/off<br>(two position) | 4-20 ma (modulating), |
| (c) | Frequency: | 50, 60 Hz |
| (d) | Power Consumption: | 9 VA Maximum |
| (e) | Spring Return Time: | 15 seconds Maximum |
| (f) | Minimum Torque: | 144 in-LB |
| (g) | Angular Rotation: | 90 Degrees |

g. Fire/Smoke Damper Actuation

(i) Actuator shall be manufactured and factory-installed by the fire/smoke damper manufacturer.

(ii) Acceptable manufacturers: Ruskin, Imperial or approved equal.

## 2.8 CONTROL VALVES

A. General

1. All automatic control valves controlled by the central control system (/BMS) shall be furnished by the controls contractor unless noted otherwise in these documents.

2. All automatic control valves shall be installed by the mechanical trade.

3. The controls contractor shall provide wiring as follows:

a. All line voltage power for electric valve actuators shall be wired by the controls contractor from the nearest available power panel. Coordinate with electrical trade.

b. All wiring between the central control system (ATC/BMS) and the valve actuator shall be wired by the controls contractor.

c. All wiring between the valve actuator and their associated thermostats, pressure switches, control devices, etc. shall be wired by the controls contractor.

d. All wiring shall comply with code requirements. Segregate high and low voltage wiring & circuits and segregate the FAS and controls (BMS) terminals.

B. Hot Water / Chilled Water Control Valves

1. Single-seated.

2. Fully proportioning with modulating plug or V-port inner valves.

3. Body pressure rating and connection type construction shall conform to fitting and valve schedules. The ANSI rating of the valve shall match the ANSI rating of the piping in which the valve is installed. Minimum ANSI rating shall be ANSI 125.

4. Stainless steel stems and trim.

5. Spring loaded Teflon packing with replaceable discs.

6. Quiet in operation.

7. Fail-safe in either normally open or normally closed position in the event of power failure.

8. Capable of operating in sequence with other valves and/or dampers when required by the sequence of operation.

9. Capable of operating at varying rates of speed to correspond to the exact dictates of the controller and variable load requirements.

10. Sized by the control manufacturer and guaranteed to meet the heating and cooling loads as scheduled.

11. Shall be suitable for the pressure conditions and shall be sized to close against 125% of the design pump head.

12. No single valve shall be larger than 2-1/2". Whenever the flow rate is such as to require a valve larger than 2-1/2", then two valves in parallel shall be used, with no one larger than 2-1/2". The valves shall operate sequentially.

13. Where pressure and flow combinations exceed ratings for commercial valves and operators, industrial class valves and operators shall be provided. Control valves shall be sized for a 5 PSI pressure drop at full flow.

C. Steam Control Valves

1. Fully proportioning with modulating plug or V-port inner valves.

2. Stainless steel stems.

3. Spring loaded Teflon packing with replaceable discs.

4. Quiet in operation.

5. Fail-safe in either normally open or normally closed position in the event of power failure.

6. Capable of operating in sequence with other valves and/or dampers when required by the sequence of operation.

7. Capable of operating at varying rates of speed to correspond to the exact dictates of the controller and variable load requirements.

8. Sized by the control manufacturer and guaranteed to meet the heating and cooling loads as scheduled.

9. Shall be suitable for the pressure conditions and shall close against 125% the differential pressures involved.

10. Body pressure rating and connection type construction shall conform to fitting and valve schedules.

11. All steam valves shall have body pressure ratings equal to or greater than that of the piping in which the valve is installed. Valves 2" and smaller, shall have bronze bodies with screwed connections. All steam valves 2-1/2" and larger shall have cast iron bodies with flanged connections.

12. No single steam valve shall be larger than 2" in size. Where the capacity requires a single valve larger than 2", two valves shall be installed in parallel, 1/3 and 2/3 of the total capacity.

D. Differential Pressure Control Valves

1. Provide for all water systems where modulating water flow conditions are required to prevent excessive pump pressure build-up. Provide a valve for each chilled and hot water system. Valve to be globe type. Provide valves 2" and smaller with screwed end bodies and provide valves 2-1/2" and larger with flanged ends.

E. Butterfly Valves

1. Furnish automatic butterfly valves for isolation requirements as shown on the drawings or required herein.

2. Butterfly valves shall be have body ratings in accordance with the piping specifications.

3. Valves shall be high performance, fully lugged with carbon steel body ANSI 300 as required by pipe specifications.

4. Valves shall be bubble tight with 316 stainless steel disc, stainless steel shaft and reinforced Teflon seat.

5. Provide fail in place, electric actuators with waterproof enclosure and crankcase heater for actuator and accessories mounted outside.

6. Provide manual override hand wheels for each valve.

7. Valves shall be Jamesbury 830L or equal.

8. Butterfly valves will only be approved for two-position (open or close) applications.

9. Valves must have lug type body connections.

2.9 DAMPERS

A. Refer to Section 23 33 10 - Dampers for additional requirements.

B. Automatically Controlled Dampers

1. Temperature control manufacturer shall provide all actuated dampers which do not have either a fire and/or smoke rating and shall comply with the following:

a. Dampers shall be of the louver type with neoprene or vinyl edged blades and end seals.

b. Louver blades shall be #16 gauge galvanized steel, maximum 8" in width.

c. Frames shall be minimum 4" reinforced flat galvanized steel with welded corners and stiffening and provisions for end seals.

d. All rods shall be non-corrosive material with provision for positive interlocking of blades and actuators on the shaft.

e. Where local codes require fire dampers on outside air intakes, rods shall not be of aluminum construction.

f. All bearings shall be nylon or Teflon.

g. All hardware shall be of non-corrosive material.

h. Two position dampers may be of the parallel-blade type. Modulating dampers shall be of the opposed-blade type.

i. Provide solid stops on all sides of the frames against which the louver shall close in order to provide maximum 2% leakage at 5" static pressure.

j. Automatic damper actuators shall be limited to a minimum of one every sixty square feet for two-position type and one every forty square feet for modulating type.

k. Damper actuators shall meet the same requirements as valve actuators with respect to operating at variable rates of speed, etc., and shall have external adjustable stops to limit the stroke in either direction.

l. All damper actuators shall be of the neoprene or rubber diaphragm piston type, with sufficient power to overcome friction of damper linkage and air pressure acting on louvers and with mounting arrangement for location outside of the air stream, wherever possible.

C. Installation

1. General

a. All electric operated dampers which have a fire and/or smoke rating shall be furnished by the mechanical contractor. All other electric operated dampers shall be furnished by this Contractor. All dampers shall be installed by the mechanical contractor.

b. The BMS contractor shall furnish damper actuators for all dampers that he furnishes. Where practical, actuators shall be factory mounted by the damper manufacturer. The controls contractor shall provide a terminal strip alongside the damper for all dampers he furnishes.

c. The Mechanical contractor shall furnish damper actuators for all dampers that he furnishes. Where practical, actuators shall be factory mounted by the damper manufacturer. The mechanical contractor shall provide a terminal strip alongside the damper for all dampers he furnishes.

d. Wiring for motor operated dampers that do not have a fire and/or smoke rating shall be provided by the controls contractor from the damper actuator and any associated end switches and sensors to a terminal strip that is wall mounted alongside the damper.

e. The controls contractor shall provide wiring as follows:

(i) Between the central control system BMS and the terminal strip for all dampers monitored and/or controlled by the BMS whether or not the controls contractor has furnished the damper.

(ii) Between the terminal strip for all dampers and their associated thermostats, pressure switches, etc. whether or not the control contractor has furnished the damper.

f. Dampers incorporating multiple sections shall be controlled in unison. Where more than one (1) actuator serves a damper, then the actuators shall be driven in unison and the control wiring shall be provided accordingly.

g. Dampers incorporating multiple sections shall be designed in such a way that the actuators are easily accessible. Under no circumstances shall it be necessary to remove damper sections or structural or other fixtures to facilitate removal of damper motors. Provide access doors wherever necessary to meet this requirement. In particular, insure that where in-air stream actuators are provided, they are readily accessible.

h. The BMS contractor shall provide all power and control wiring for all automatic, fire/smoke or smoke dampers as required to accomplish the HVAC and smoke control sequences of operation. A portion of this work may also be specified in other areas of the specification. It is the responsibility of the BMS contractor to coordinate this work with the other trades. Any work not performed by others will be the ultimate responsibility of the BMS contractor. The fire alarm system shall be able to open or close each damper, regardless of BMS commands.

i. The following table summarizes the trade responsibilities with respect to automatic dampers:

| | NON-FIRE OR SMOKE RELATED DAMPERS | FIRE AND/OR SMOKE RATED DAMPERS NOT CONTROLLED BY FIRE ALARM SYSTEM | FIRE AND/OR SMOKE RATED DAMPERS CONTROLLED BY FIRE ALARM SYSTEM |
|---|---|---|---|
| Furnish Damper | Controls Contr. | Mech. Trade | Mech. Trade |
| Install Damper | Mech. Trade | Mech. Trade | Mech. Trade |
| Furnish Actuator(s) | Controls Contr. | Mech. Trade | Mech. Trade |
| Install Actuator(s) | Mech. Trade | Mech. Trade | Mech. Trade |
| Install and furnish terminal strip complete with all relays, wiring, etc. | Controls Contr. | Mech. Trade | Mech. Trade |
| Provide wiring between actuator, end switches, heat sensors, and terminal strip | Controls Contr. | Mech. Trade | Mech. Trade |
| Provide wiring from Central Control System (BMS) to damper terminal strip | Controls Contr. | Controls Contr. | Controls Contr. |
| Provide wiring from FAS to damper terminal strip | | | Electrical Trade |

| | NON-FIRE OR SMOKE RELATED DAMPERS | FIRE AND/OR SMOKE RATED DAMPERS NOT CONTROLLED BY FIRE ALARM SYSTEM | FIRE AND/OR SMOKE RATED DAMPERS CONTROLLED BY FIRE ALARM SYSTEM |
|---|---|---|---|
| Furnish 120V main power to elect. Actuators (See notes below) | Controls Contr. | Controls Contr. | Electrical Trade |
| Provide wiring from damper terminal strip to terminal strips for interlocked motors, etc. | Controls Contr. | Controls Contr. | Controls Contr. |
| Provide wiring from damper terminal strip directly to thermostats, etc. | Controls Contr. | Controls Contr. | Controls Contr. |

NOTES

1. Controls contractor shall have overall responsibility for the complete coordination of the work and the operation of the damper/actuator installation.

2. In mechanical rooms 120V power circuits will be provided from an emergency distribution board. These circuits will be terminated in a junction box located in each associated mechanical room and shall be used by the controls contractor to supply local control panels and critical equipment.

3. These circuits will also be used by the electrical trade to supply dampers, etc. requiring control by the Fire Alarm System. Final connection from the terminal strips to the actuators, end switches and sensors shall be by the mechanical trade.

4. For dampers not requiring control by the fire alarm system and for other non-critical equipment, obtain power from either the emergency circuits as detailed above or from the motor starter terminal trip. All wiring shall be by the controls contractor.

5. Damper Terminal Strips

   a. Terminal strip(s) shall be provided alongside all motorized dampers. If the damper has a smoke and/or fire rating, the terminal strip shall be provided by the Mechanical Trade. If the damper does not have a fire and/or smoke rating then the terminal strip shall be provided by the controls contractor.

   b. Where dampers are furnished by the controls contractor then he shall provide relays, interconnect wiring and other components to meet the requirements detailed below. The terminal strip(s), relays, etc. shall be housed in wall mounted enclosures which meet the specifications detailed for local starter enclosures.

c. The terminal strip shall be wired such that the Central Control System (BMS) can undertake the following control and monitoring functions:

(i) Open Control - A pair of terminals shall be wired such that when a controls (BMS) relay closes a contact pair across these terminals the damper is driven open. If the damper is two position with an actuator which drives closed and springs open on loss of power then these terminals shall not be used. This signal from the Central Control System (BMS) shall be overridden by a close signal from the Fire Alarm System (FAS) Where dampers are interlocked to motors then the wiring shall be to these terminals.

(ii) Close Control - A pair of terminals shall be wired such that when a controls (BMS) relay closes a contact pair across these terminals the damper is driven closed. If the damper is two position with an actuator which drives open and springs closed on loss of power then these terminals shall not be used. This signal from the Central Control System (BMS) shall be overridden by an open signal from the FAS.

(iii) Motor Interlock - A pair of terminals shall be wired to an end switch on the actuator such that the contacts between the terminals shall be closed when the damper is fully open and open when the damper is not fully open. This pair of terminals shall be used for interlocking a damper with a motor such that the motor will not be able to start if the damper is not fully open.

2.10 CONTROL PANELS

A. Field Equipment Cabinets

1. All DDC controllers, transformers, electric relays, static pressure sensors, velocity pressure sensors, manual override switches, etc., shall be mounted in an appropriate NEMA enclosure and factory wired to terminal strips. The enclosure shall be constructed of steel or extruded aluminum and shall be properly rated for the location. Securely mount the enclosures to the wall or floor of the building structure using approved bracing adjacent to each system to be controlled.

2. Cabinets shall allow extra space for installation of future control components.

3. Submit for approval all proposed locations of DDC control and accessory panels.

4. Submit for approval dimensioned shop drawings of the panel equipment layout prior to panel fabrication.

5. Properly label all panel components including wiring and tubing.

PART 3 - EXECUTION

3.1 DESIGN CRITERIA

A. The Building Management System (BMS) shall be programmed to start and stop the HVAC equipment based on occupancy schedules as coordinated with the owner. The BMS shall also provide equipment interlocks as required.

B. Each preheat coil section shall be provided with a separate sensor, control loop, output signal, freezestat, and control valve.

C. All control valves that are sequenced shall be provided with dedicated analog outputs or positioning relays, as applicable.

D. All control dampers that are sequenced shall be provided with dedicated analog outputs or positioning relays, as applicable.

E. Fire Alarm Interface for Fans

1. The Fire Alarm System shall provide outputs to notify the BMS of fire alarms.

2. All fan systems shall be stopped from the FAS. When the fan system stops, all associated dampers shall close.

3. All return and exhaust fans shall be stopped from the FAS. When the fan stops, all associated dampers shall close.

F. All safeties shall be capable of being remotely reset from the BMS.

G. All setpoints shall be adjustable from any BMS personal computer operator workstation via single point commands.

H. All reset schedule parameters shall be adjustable from any BMS personal computer operator workstation via single point commands.

I. All inputs and outputs shall be provided with programmable (adjustable) high and low software alarm limits.

3.2 INSTALLATION CRITERIA

A. Space mounted devices are to be identical in appearance. All devices shall be mounted under the same style cover.

B. Room sensors and thermostats shall not be located on outside walls.

C. Provide all relays, switches, sources of electricity and all other auxiliaries, accessories and connections necessary to make a complete operable system in accordance with the sequences specified.

D. Install controls so that adjustments and calibrations can be readily made. Controls are to be installed by the control equipment manufacturer.

E. Mount surface-mounted control devices, tubing and raceways on brackets to clear the final finished surface on insulation.

F. Conceal control conduit and wiring in all spaces except in the Mechanical Equipment Rooms and in unfinished spaces. Install in parallel banks with all changes in directions made at 90 degree angles.

G. Install control valves horizontally with the power unit up. Installation of control valves will be by the mechanical contractor.

H. Unless otherwise noted, install wall-mounted sensors, thermostats and humidistats to meet ADA requirements. Submit device samples, locations, mounting heights and details for approval for all devices.

I. Install outdoor thermostats in perforated tube and sun shield.

J. All relays, electrical wiring, panels, outputs, etc. to make a complete operational system, shall be provided and installed by this section. See sequences of operation for details.

K. Component Tags

1. All automatic and manual valves provided by this contractor, shall be identified with 2" diameter brass tags and brass chains. Lettering shall be ½" high, stamped and painted black. Automatic valve tags shall be stamped with the letters "AV" and sequentially numbered. Provide valve schedule and sample tags for approval.

2. All sensors shall be identified with 1"x 3" black labels with white lettering. Lettering shall be 1/4" high. Provide sensor number, HVAC Unit number, part number and sensor range on tag. Submit tag schedule and sample for approval.

3. All panels, auxiliary component panels, transformer panels, etc. provided by this contractor, shall be identified with 2"x 5" black lamacoid labels with engraved white lettering. Lettering shall be ½" high. Provide panel number, HVAC unit number and service on tag. Submit tag schedule and sample for approval.

3.3 ELECTRICAL WIRING

A. The BMS Contractor shall be responsible for all electrical control work associated with the BMS, HVAC and plumbing systems which is not specified as work of others.

1. Perform all wiring in accordance with all local and national codes including the NEC.

2. Install all line voltage wiring, concealed or exposed, in conduit in accordance with the Division 26 specifications, NEC and local building code.

3. All low voltage electrical control wiring and all Primary Network wiring throughout the building shall be run in conduit. Terminal equipment sensors and the secondary network wiring may be run in plenum rated cable above accessible hung ceilings. Plenum cable shall be run parallel to building lines and supported from the building structure (not from duct, pipe or associated hangers) with bridle rings.

4. Provide extension of 120 volt, 20 amp circuits and circuit breakers from emergency power panels for entire system, except terminal equipment, as required.

5. Surge transient protection shall be incorporated in the design of system to protect electrical components in all DDC control panels and operator workstations.

6. Provide all miscellaneous field device mounting and interconnecting control wiring for all mechanical systems including but not limited to the AC units, condensing units, expansion tanks, VFDs, terminal units, fan coil units, fans, water leak detectors, etc.

7. All systems requiring interconnecting control wiring as specified herein, shall have hardwired interlocks and shall not rely on the BMS to operate. Interconnecting wiring shall be run in conduits separate from the BMS associated wiring.

8. All wiring for network communication, sensor signals and interlock wiring shall be permanently labeled at a minimum of 10-foot intervals. Label shall indicate BMS manufacturer's name and cable usage. Labels shall be securely fastened and not be damaged during installation. Cable jackets shall also be color coded to indicate application.

9. Cables shall be tagged or labeled at each termination point and in each intermediate junction box, pull box or cabinet through which they pass.

10. All control and power wiring associated with the control of all automatic, fire/smoke or smoke dampers shall be installed in conduit, regardless of voltage. All control and power wiring for relays associated with the control of any automatic, fire/smoke or smoke damper shall be installed in conduit, regardless of voltage.

11. Data communication between separate buildings or facilities shall be via fiber optic cable only.

12. Provide all line and low voltage wiring for the control of all HVAC, motors (whether individual or as part of packaged equipment) and dampers, control panels. Provide wiring to interface devices (relays or others) located within 3 feet of each damper requiring direct smoke and fire control by the Fire Protective Alarm (FPA) System in addition to its automatic temperature control operation.

    a. A separate system of wiring, for smoke and fire control of motors which are to be automatically and/or manually controlled by the fire protective alarm (FPA) system will be run to the motor starters or SCU enclosures by the electrical trade.

b. Wiring, for smoke and fire control of dampers which are to be automatically and/or manually controlled directly by the FPA system (i.e., not in response to motor operation) will be run by the electrical trade. Wiring will include connections to an adequate 120 volt emergency source, and to interface relays provided as part of the automatic temperature control work within 10 feet of each such damper which is also to be controlled as part of the automatic temperature control work.

13. The BMS contractor shall provide wiring:

a. All control and alarm wiring for all control and alarm devices for all Sections of Specifications.

b. 120 volt, single phase, 60 hertz emergency power to every BMS panel, VAV box controller, valve transmission power supplies, and to other devices as required. It is the intent that the entire building management system and all peripheral devices, alarms, etc., shall be operative under emergency power conditions in the building. The power supplies are to be extended in conduit and wire from emergency circuit breakers.

c. Provide power supply wiring (as required) to all dampers which do not require “direct” (i.e., not in response to motor operation) smoke and fire control by the fire protective alarm (FPA) system.

d. Provide status function conduit and wiring for equipment covered under this section.

e. Provide conduit and wiring between the BMS panels and the temperature, or pressure sensing elements, including low voltage control wiring.

f. Provide conduit and control wiring for devices specified in this Section.

g. Provide conduit and wiring between the PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contractors, and BMS panels, as shown on the drawings or as specified.

h. Provide electrical wall box and conduit sleeve for all wall mounted devices.

i. Firestopping shall be provided for all penetrations of conduit, etc. through fire rated walls and floors and other fire rated separations.

j. Where conduit is required, it shall be steel electric metallic tubing (EMT), except that it shall be galvanized intermediate steel conduit where located within 8'-0" of the floor in mechanical spaces (or is otherwise exposed to mechanical damage), or is intended for embodiment in concrete.

14. Wires and cables shall have characteristics - in compliance with Articles 725 and/or 800 (as applicable) of the National Electrical Code - as described elsewhere in the specifications or drawings for this project, and shall be UL listed in accordance therewith.

15. Where wires and cables are permitted to be run without conduit, they shall be independently supported from the building structure or ceiling suspension systems at intervals not exceeding four feet on center, utilizing cable supports specifically approved for the purpose. Wires and cables shall not rest on or depend on support from suspended ceiling media (tiles, lath, plaster, as well as splines, runners or bars in the plane of the ceiling), nor shall they be supported from pipes, ducts or conduits. Where cables are bundled together, separate bundles shall be provided separately for each type of cabling and separately for each independent system. Bundling and/or supporting ties shall be of a type suitable for use in a ceiling air handling plenum regardless of whether or not installed in a plenum.

16. Utilize #14 A.W.G. THWN conductors minimum throughout for power wiring (120 VAC or greater) except in conjunction with a manual starter. For a manual starter, utilize conductors equal in size to those in the power circuit.

17. Motor control circuit wires may be run in the same conduit as the wires of motor power circuits; however, abide by the following:

    a. Exclude motor control wires from enclosures (other than motor starter enclosures) which contain power circuit overcurrent protection and switching devices;

    b. Exclude motor control wires from pull boxes and junction boxes containing the wires of main and submain feeders.

    c. Utilize auxiliary pull boxes to separate motor control wires from motor power circuit wires at a point before the power circuit wires enter the items from which motor control wires are excluded.

    d. Exclude motor control wires from the same conduits as motor power circuit wires larger than 250 MCM.

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

    a. Wires and Cables:

        (i) American Insulated Wire Corporation, Leviton Manufacturing Co.

        (ii) Brand-Rex Cable Systems, Brintec Corp.

        (iii) Carol Cable Company, Inc.

        (iv) Senator Wire & Cable Co.

        (v) Southwire Co.

        (vi) Belden Division, Cooper Industries

        (vii) Cable & Wire Division, A.T.& T.

(viii) American Insulation Wire Company.

b. Connectors for Wires and Cables:

(i) AFC, Monogram Co.

(ii) AMP, Inc.

(iii) Anderson, Square D Co.

(iv) Electrical Products Division, 3M Co.

(v) O-Z/Gedney Unit, General Signal.

c. Connectors and Splices

(i) UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.

19. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

20. Utilize copper conductors with THWN, THHN or XHHW insulation. Type THHW and THHW-2 shall not be utilized where excluded by conduit sizing. Type THWN shall not be utilized for connection to 100% rated overcurrent devices.

21. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.

22. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.

23. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

24. 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.

25. Properly ground all field equipment panels and terminal unit equipment.

3.4 COORDINATION

A. Coordination with Other Trades

1. Piping and duct installation requirements are specified in other Division 23 Sections. Coordinate installation of all devices furnished under this section to be installed by other trades with the appropriate trade.

2. It is the responsibility of this contractor to coordinate with all trades the location of installed equipment and routing of all electrical and pneumatic control conduits and lines.

3. Install control system components to allow for proper service and maintenance of equipment.

B. Work Performance Schedule

1. A time-phased schedule for delivery, installation, and acceptance of components for the complete system shall be prepared. Submit this schedule to the Owner within five (5) days after award of contract. Submit updates and changes to this schedule promptly to the Owner.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

B. Commissioning, Testing and Acceptance

1. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets that shall be submitted prior to acceptance testing. Commissioning work that requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the owner and construction manager to ensure systems are available when needed. Notify the operating personal in writing of the testing schedule so that authorized personnel from the owner and construction manager are present throughout the commissioning procedure.

2. Phase I – Field I/O Calibration and Commissioning

a. Verify that each control panel has been installed according to plans, specifications and approved shop drawings. Calibrate, test, and have signed off each control sensor and device. Commissioning to include, but not be limited to:

(i) Sensor accuracy at 10, 50 and 90% of range.

(ii) Sensor range.

(iii) Verify analog limit and binary alarm reporting.

(iv) Point value reporting.

(v) Binary alarm and switch settings.

(vi) Actuator and positioner spring ranges if pneumatic actuation is utilized.

(vii) Fail safe operation on loss of control signal, pneumatic air, electric power, network communications, etc.

3. Phase II – System Commissioning

a. Each BMS program shall be put on line and commissioned. The contractor shall, in the presence of the owner and construction manager, demonstrate each programmed sequence of operation and compare the results in writing. In addition, each control loop shall be tested to verify proper response and stable control, within specified accuracy. System program test results shall be recorded on commissioning data sheets and submitted for record. Any discrepancies between the specification and the actual performance will be immediately rectified and re-tested.

4. Phase III - Integrated System Program Commissioning

a. Tests shall include, but not be limited to:

(i) Data communication, both normal and failure modes.

(ii) Fully loaded system response time.

(iii) Impact of component failures on system performance and system operation.

(iv) Time/Date changes.

(v) End of month/ end of year operation.

(vi) Season changeover.

(vii) Global application programs and point sharing.

(viii) System backup and reloading.

(ix) System status displays.

(x) Diagnostic functions.

(xi) Power failure routines.

(xii) Battery backup.

(xiii) Testing of all electrical and HVAC systems with other division of work.

b. Test procedure and documentation shall be as follows:

(i) Submit for approval, a detailed acceptance test procedure designed to demonstrate compliance with contractual requirements. This Acceptance test procedure will take place after the commissioning procedure but before final acceptance, to verify that sensors and control devices maintain specified accuracy and the system performance does not degrade over time.

(ii) Using the commissioning test data sheets, the contractor shall demonstrate each point. The contractor shall also demonstrate 100 percent of the system functions. The contractor shall demonstrate all points and system functions until all devices and functions meet specification.

(iii) The BMS contractor shall supply all instruments for testing. Instruments shall be turned over to the owner after acceptance testing.

(iv) All test instruments shall be submitted for approval prior to their use in commissioning.

(v) Test Instrument Accuracy:

(a) Temperature: 1/4F or 1/2% full scale, whichever is less.

(b) High Pressure (PSI): ½ PSI or 1/2% full scale, whichever is less.

(c) Low Pressure: 1/2% of full scale (in w.c.)

(d) Humidity: 2% RH

(e) Electrical: 1/4% full scale

(vi) After the above tests are complete and the system is demonstrated to be functioning as specified, a thirty-day performance test period shall begin. If the system performs as specified throughout the test period, requiring only routine maintenance, the system shall be accepted. If the system fails during the test, and cannot be fully corrected within eight hours, the owner may request that performance tests be repeated.

c. Sub Systems shall also be tested and commissioned.

5. Move In Checkout

a. Each floor shall be re-tested 24 hours prior to move in. The test shall ensure all corrective work is complete and all systems are 100% operational.

6. Additional testing, debugging and fine tuning

    a. Provide an additional 24 overtime hours of appropriate highest labor cost category to be used at the owner's discretion to test, debug and fine tune the system after occupancy.

C. Owner System Performance Verification (OSPV)

1. The systems and equipment shall be fully functional and operational prior to the OSPV process, or the contract(s) will be back-charged accordingly.

2. OSPV is the process in which the contractor fully demonstrates system operation, system performance, proper operation of the sequence of operations, and system equipment to the Owner's operating staff in the presence of an OSPV agent.

3. After the contractor's obligations are completed, including system testing, equipment testing, calibration, system demonstration, sequence of operation start-up, training, providing of maintenance and operation manuals, and corrective action for all punchlist items, the OSPV process begins. The BMS contractor shall include in their bid 16 hours for the OSPV process.

4. Complementary to the BMS contractor's responsibility to commission the building systems, an OSPV agent will be retained by the Owner. This OSPV agent will provide independent equipment-systems installation inspection and performance verification. The independent verification will be requested prior to final equipment and systems acceptance by the Owner. It should be emphasized that independent systems verification prior to the OSPV process does not negate the BMS contractor's obligations to full commission the control system.

5. The OSPV agent will verify system installation, operation, performance, and sequences of operation after the BMS contractor provides written notice that the building system is completed, tested, and fully operational. Upon this notification, the OSPV agent will perform the initial verification. The OSPV agent will provide one (1) additional installation and performance verification, upon notification by the BMS contractor that deficiencies identified have been corrected. Any subsequent installation and performance verification will be at the BMS contractor's expense.

6. All building systems shall be verified under actual and simulated full load conditions.

7. The Owner, Architect, Engineer, and OSPV agent will have input to and be part of the approval process for systems performance verification.

8. The Owner's staff shall be informed of all system start-up, shutdown, and verification procedures that involve any utility usage or interruption.

9. The BMS contractor's technicians provided for the OSPV process shall be thoroughly familiar with the OSPV process (start-up, sequence of operation, shutdown, etc.) and the system or equipment required for the OSPV work. The personnel must also be thoroughly familiar with the project specifications and drawings. Convenient technician substitutes for the OSPV process are unacceptable.

10. Under OSPV, the following shall be verified:

    a. Point to point verification of all BMS points.

    b. The sequence of operation for all systems and equipment.

    c. Calibration of all inputs and outputs.

    d. Operation of the compressed air plant.

    e. System programming.

    f. Standard operation procedures (SOP).

11. The OSPV process includes but is not limited to the above items.

3.7 DEMONSTRATION

A. Maintenance Data and Operating Instructions

1. Description - Maintenance and operating manuals in accordance with Section 01 00 00, General Requirements.

    a. Prepare data in the form of an instructional manual.

2. Manual for Equipment and Systems

    a. Each item of equipment and each system: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and test, and complete nomenclature and model number of replaceable parts.

    b. Panelboard Circuit Directories: provide electrical service characteristics, controls, and communications.

    c. Include wiring diagrams as installed.

    d. Operating Procedures: Includes start-up, break-in and routine normal operating instructions and sequences. Include regulation, control stopping, shutdown and emergency instructions. Include summer, winter, and any other special operating instructions.

e. Maintenance Requirements: Include routine procedures and guide for preventative maintenance, trouble shooting; disassembly repair, re-assembly instructions including alignment, adjusting, balancing, and checking instructions.

f. Provide servicing and lubrication schedule for dampers and actuators. Provide a list of lubricants required.

g. Include manufacturers printed operation and maintenance instructions.

h. Include sequence of operation by controls manufacturer.

i. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams.

j. Provide control diagrams by controls manufacturer as installed.

k. Provide contractor's coordination drawings with control piping diagrams as installed.

l. Provide list of original manufacturer's spare parts. Provide a recommendation of quantities to be maintained in storage.

m. Provide additional requirements as specified in individual product specification sections.

3. Instruction of Facility Personnel

a. Before final inspection, instruct Owner's designated personnel in operation, adjustment and maintenance of products, equipment, and systems, at agreed upon times.

b. For equipment requiring seasonal operation, perform instruction for other seasons within six months.

c. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

d. Prepare and insert additional data in Operation and Maintenance manual when need for such data becomes apparent during instruction.

4. After all final tests and adjustments have been completed, fully instruct the proper Owner's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.

5. Instruct Owner on the maintenance instructions for draining and protecting chilled water coils in the winter.

B. Display of Maintenance Instructions

1. One set of operating and maintenance instructions shall be neatly framed behind glass and hung adjacent to the equipment concerned.

C. Training

1. The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed rather than a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays.

2. Provide eight (8) hours of training for Owner's operating and maintenance personnel.

a. Explanation of drawings, operator’s and maintenance manuals.

b. Walk-through of the job to locate all control components.

c. Operator workstation and peripherals.

d. DDC Controller and ASC operation/function.

e. Operator control functions including graphic generation, if design includes color graphics, and field panel programming.

f. Operation of portable operator's terminal, if an operator terminal is provided to the owner as per this specification.

g. Explanation of adjustment, calibration and replacement procedures.

3.8 ON-SITE ASSISTANCE

D. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested by the Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

END OF SECTION 23 09 00

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