Flad Architects

Gov. Juan F. Luis Hospital & Medical Center

St. Croix U.S. Virgin Islands

JFL 5 Acre Parcel Development

Christiansted, St. Croix, Virgin Islands, United States

Flad Project No.23245-00 July 21, 2023

Procurement Package Volume 1

Flad Architects

Flad & Associates, Inc. 644 Science Drive Madison, WI 53711

Flad Structural Engineers Flad & Associates, Inc. 644 Science Drive Madison, WI 53711

Harris Civil Engineers, LLC 1200 Hillcrest Street Orlando, FL 32803

TLC Engineering Solutions 4890 W. Kennedy Blvd #250 Tampa, FL 33609

SECTION 00 0105 CERTIFICATIONS PAGE

CIVIL

I hereby certify that the plans and specifications for Civil Engineering Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

LANDSCAPE ARCHITECTURE

I hereby certify that the plans and specifications for Landscape Work were prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

ARCHITECTURAL

I hereby certify that the plans and specifications for Architectural Work were prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

STRUCTURAL

I hereby certify that the plans and specifications for Structural Engineering Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

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MECHANICAL

I hereby certify that the plans and specifications for Mechanical Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

HVAC

I hereby certify that the plans and specifications for HVAC Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

PLUMBING

I hereby certify that the plans and specifications for Plumbing Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

FIRE PROTECTION

I hereby certify that the plans and specifications for Fire Protection Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

ELECTRICAL

I hereby certify that the plans and specifications for Electrical Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

ELECTRONIC SAFETY AND SECURITY

I hereby certify that the plans and specifications for Electronic Safety and Security Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of U.S. Virgin Islands.

Name

Registration No.

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SECTION 01 1000 SUMMARY

PART 1 GENERAL

1.01 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.

1.02 PROJECT INFORMATION

- A. Project Identification: JFL MC 5-Acre Parcel Development Master Plan.
 - 1. Project Location:
 - 4007 Estate Diamond Ruby Christiansted, St. Croix U.S. Virgin Islands 00821
- B. Owner: The Virgin Islands Government Health and Hospital Facilities Corporation
 - 1. Owner's Representative: [Insert name and contact information for Owner's representative].
- C. Architect: Flad Architects 644 Science Drive Madison, Wisconsin 53711

1.03 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents.
 - 1. Construction of new JFL Storage Building and all associated site improvemnts. Building is a one story steel frame structure of 9500 square feet, with steel stud walls, stucco cladding and a TPO roof membrane on metal deck..
- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.04 ACCESS TO SITE

- A. General: Construction Manager shall have full use of Project site for construction operations during construction period. Construction Manager's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways, loading areas, 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.
 - 2. Coordinate all use of the site with Owner.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.05 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy adjacent site and the temporary hospital (THS) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with

JFL - THS 5 ACRE LAND LEASE SITE Procurement Package 07/21/2023 Project No. 23245-00 Summary Section 01 1000 - 1 Owner's day-to-day 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 approval of authorities having jurisdiction.
- 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

1.06 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal working hours 7:30 a.m. to 6:30 p.m.M, Monday through Friday, unless otherwise indicated or previously agreed to in writing by the 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 Architect not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Architect'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 Architect not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Architect's written permission before proceeding with disruptive operations.
- E. Controlled Substances: Use of tobacco products and other controlled substances within the existing building is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.07 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 Drawings are described in detail in the Specifications. One or more of the following are used on 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 published as part of the U.S. CAD Standard and scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 PRODUCTS (NOT USED) PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 2300 ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.

1.02 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.03 SCHEDULE OF ALTERNATES

A. Alternate No. [___] - [____]:
1. Base Bid Item: Section [____] and Drawing number [___] including [____].

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

SECTION 01 2500 SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.03 SUBMITTALS

- A. Substitution Requests: Submit three 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 Project Manual.
 - 2. Limit each request to a single proposed substitution.

1.04 QUALITY ASSURANCE

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

1.05 PROCEDURES

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

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:
 - 1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

- 1. Note explicitly any non-compliant characteristics.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 - 1. Substitution Form included in the Project Manual shall be used.
 - a. Project Information:
 - 1) Official project name and number, and any additional required identifiers established in Contract Documents.
 - 2) Owner's, Architect's, and Contractor's names.
 - b. Substitution Request Information:
 - 1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
 - 2) Indication of whether the substitution is for cause or convenience.
 - 3) Issue date.
 - 4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
 - 5) Description of Substitution.
 - 6) Reason why the specified item cannot be provided.
 - 7) Differences between proposed substitution and specified item.
 - 8) Description of how proposed substitution affects other parts of work.
 - c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
 - 1) Physical characteristics.
 - 2) In-service performance.
 - 3) Expected durability.
 - 4) Visual effect.
 - 5) Sustainable design features.
 - 6) Warranties.
 - 7) Other salient features and requirements.
 - 8) Include, as appropriate or requested, the following types of documentation:
 - (a) Product Data:
 - (b) Samples.
 - (c) Certificates, test, reports or similar qualification data.
 - (d) Drawings, when required to show impact on adjacent construction elements.
 - d. Impact of Substitution:
 - 1) Savings to Owner for accepting substitution.
 - 2) Change to Contract Time due to accepting substitution.
- E. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTIONS

- A. Substitution for Cause: Submit request within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- B. Substitutions for Contractor's Convenience: Not allowed.
- C. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to the Contract Documents.

3.03 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractorin writing of decision to accept or reject substitution request, within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - 1. Architect's decision following review of proposed substitution will be noted on the submitted form.
 - 2. Use product specified if Architect does not issue a decision on use of proposed substitution within time allocated.

3.04 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

DOCUMENT 01 2500.13

SUBSTITUTION REQUEST FORM

Project:			Substitution Request Number:		
To:	Flad Architects		From:		
10.	Address				
	Attn:				
	с т и				
Speci	Section:	Page:		Article/Paragrapl	h:
Propo	sed Substitution:				
Manu	facturer:	Address:			Phone #:
Trade	Name:				Model #:
Install	er:	Address:			Phone #:
Histor	ry: 🗌 New Product	☐ 2-5 years o	bld	☐ 5-10 years old	More than 10 years old
Differe	ences between proposed substitution	and specified product:			
Simila	ar Installation:				
	Project:		Archite	ect:	
Address:			Owner	:	
			Date Ir	nstalled:	
Propo	esed substitution affects other parts of	Work: 🗌 No 🛛	☐ Yes; expl	ain:	
Savings to Owner for accepting substitution:					(\$)
Propo	esed substitution changes Contract Tir	ne: 🗌 No 🗌] Yes	Add/Deduct	days.
Suppo	orting Data Attached:				
	Product Data Drawing	s 🗌 Tests 🔲 Re	eports 🔲 :	Samples	
Susta	inable design: LEED Credits – Refer t	o Section 01 8113 – S	ustainable D	esign Requirements fo	or specific requirements.
VOC	content: Recy	cled content:		Has Material Ing	redient Reporting (Y/N):
Recyc	clability: Has E	Environmental Product	Declaration	(Y/N):	

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

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will not affect or delay Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including architectural or engineering design, detailing, and construction costs.
- Coordination, installation, and changes in the Work as necessary for accepted substitutions will be complete in all respects.

Submitted by:		
Signature:		
Firm:		
Address:		
Date:		
Telephone:		
Attachments:		

ARCHITECT'S REVIEW AND ACTION

- □ Substitution Approved. Submit in accordance with Division 01 Section "Product Requirements.
- □ Substitution Approved as noted. Submit in accordance with Division 01 Section "Product Requirements".
- □ Substitution Rejected. Does not comply with Division 01 Section "Product Requirements" for conditions of substitutions. Use specified materials.
- □ Substitution Rejected. Is not equal to specified materials as evaluated by the Architect. Use specified materials.

Signed by	Date:		
Additional Comments:			
	END OF FORM		

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SECTION 01 2600 CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for handling and processing Contract modifications.

1.02 REFERENCE STANDARDS

- A. AIA G701 Change Order.
- B. AIA G710 Architect's Supplemental Instructions.
- C. AIA G714 Construction Change Directive.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue through the Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA G710.

1.04 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. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in the 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 indicating 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 Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 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 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 indicating 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 Contract Time.
 - 6. Comply with Section 01 2500 Substitution Procedures, if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form acceptable to Architect.

1.05 CHANGE ORDER PROCEDURES

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

1.06 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA 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)

SECTION 01 2613 REQUESTS FOR INFORMATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requests for Information (RFIs).

1.02 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking seeking one of the following.
 - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.

1.03 REQUESTS FOR INFORMATION (RFI'S)

- A. Prepare an RFI immediately on discovery of the need for additional information or interpretation of the Contract Documents. Submit RFI in the form specified through the General Contractor to the Architect.
 - 1. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in the execution of the work.
 - 2. Architect will return RFIs submitted directly to Architect by other entities controlled by Contraactor with no response.
 - 3. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Prepare a separate RFI for each specific item.
 - 1. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - 2. Do not forward requests which solely require internal coordination between subcontractors.
- C. Prepare in a format and with content acceptable to Owner.
- D. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- E. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 - 1. Include in each request Contractor's signature attesting to good faith effort to determine from the Contract Documents information requiring interpretation.
 - 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
 - a. Approval of submittals.
 - b. Approval of substitutions.
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
 - 3. Improper RFIs: Requests not prepared in conformance to requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 - 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-andmaterials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

- F. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 - 9. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 - 10. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
 - 11. Contractor's signature.
 - 12. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- G. RFI Forms: Software generated form with substantially the same content as indicated above, acceptable to Architect.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- H. RFI Log: Prepare and maintain a tabular log of RFIs, organized by RFI number, for the duration of the project.
 - 1. Include RFI description.
 - 2. Indicate current status of every RFI. Update log promptly and on a regular basis.
 - 3. Indicate RFIs that were returned without action or withdrawn.
 - 4. Note dates of when each request is made, and when a response is received.
 - 5. Highlight items requiring priority or expedited response.
 - 6. Highlight items for which a timely response has not been received to date.
 - 7. Identify and include improper or frivolous RFIs.
- I. Review Time: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- J. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Construction Manager's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 - 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.

- 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
- 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
- 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

SECTION 01 2900 PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements necessary to prepare and process Applications for Payment.

1.02 REFERENCE STANDARDS

- A. AIA G703 Continuation Sheet.
- B. AIA G706A Contractor's Affidavit of Release of Liens.
- C. AIA G707 Consent of Surety to Final Payment.

1.03 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Construction Manager's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest onehundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under Contractor and principal subcontracts for Sustainable Design documentation and other Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
 - 4. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
 - 5. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 - 6. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments

or deposits, if any, and balance to be paid by Construction Manager.

1.04 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
 - 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from entities lawfully entitled to file a mechanic's lein arising out of the Contract and related work covered by the payment.
 - 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2. When an application shows completion of an item, submit conditional final or full waivers.
 - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

- 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
- 5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include:
 - 1. List of subcontractors.
 - 2. Schedule of values.
 - 3. Contractor's construction schedule (preliminary if not final).
 - 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 - 5. Products list (preliminary if not final).
 - 6. Sustainable design action plans, including preliminary project materials cost data.
 - 7. Schedule of unit prices.
 - 8. Submittal schedule (preliminary if not final).
 - 9. List of Contractor's staff assignments.
 - 10. List of Contractor's principal consultants.
 - 11. Copies of building permits.
 - 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 13. Initial progress report.
 - 14. Report of preconstruction conference.
 - 15. Certificates of insurance and insurance policies.
 - 16. Performance and payment bonds.
 - 17. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, include, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA G706A.
 - 5. Evidence that claims have been settled.
 - 6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 7. Final liquidated damages settlement statement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

SECTION 01 3100 PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coordination drawings.
- B. Preconstruction meeting.
- C. Pre-Installation meetings.
- D. Progress meetings.
- E. Project closeout meetings.

1.02 SUBMITTALS

- A. 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.
 - 1. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 2. Post copies of list in project meeting room, in temporary field office, and on Project Web site. Keep list current at all times.

1.03 PROJECT COORDINATION

- A. Project Coordinator: Construction Manager.
- B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Project Coordinator.
- D. Comply with Project Coordinator's procedures for intra-project communications; progress meetings, pre-installation meetings, submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
- E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Project Coordinator.
- G. Make the following types of submittals to Architect through the Project Coordinator:
 - 1. Requests for information.
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Manufacturer's instructions and field reports.
 - 6. Applications for payment and change order requests.
 - 7. Progress schedules.
 - 8. Coordination drawings.
 - 9. Closeout submittals.

1.04 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
- 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and direction of Project Coordinator to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.05 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
- B. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - 1. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - 2. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - 3. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - 4. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - 5. Indicate required installation sequences.
 - 6. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- C. Review drawings prior to submission to Architect.

1.06 PRECONSTRUCTION MEETING

- A. Owner will schedule a meeting after Notice of Award.
- B. Construction Manager will schedule a meeting after Notice of Award.
- C. Attendance Required:
 - 1. Owner.
 - 2. Architect.
 - 3. Commissioning Authority.

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- 4. Contractor.
- D. Agenda:
 - 1. Execution of Owner-Construction Manager Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
 - 5. Submission of initial Submittal Schedule
 - 6. Designation of personnel representing the parties to Contract, Contractor and Architect.
 - 7. Working hours, work restrictions, and use of premises.
 - 8. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 9. Procedures for RFI's.
 - 10. Security, first aid, equipment deliveries and priorities, and parking.
 - 11. Responsibility for temporary facilities and controls.
 - 12. Procedures for moisture and mold control.
 - 13. Construction waste management and recycling.
 - 14. Scheduling.
 - 15. Scheduling activities of a Geotechnical Engineer.
- E. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

1.07 PRE-INSTALLATION METTINGS

- A. Schedule and administer meetings prior to each component of the Work that requires coordination with other construction activities.
- B. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: As appropriate to agenda topics for each meeting. Attendees shall be authorized to conclude matters relating to the Work.
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Commissioning Authority.
 - 5. Contractor's Superintendent.
 - 6. Subcontractors and Suppliers involved or affected by installation
- D. Agenda:
 - 1. Contract Documents.
 - 2. Options.
 - 3. Related RFIs.
 - 4. Related Change Orders.
 - 5. Purchases.
 - 6. Deliveries.
 - 7. Submittals.
 - 8. Review of mockups.
 - 9. Possible conflicts.
 - 10. Compatibility requirements.
 - 11. Time schedules.
 - 12. Weather limitations.
 - 13. Manufacturer's written instructions.
 - 14. Warranty requirements.
 - 15. Compatibility of materials.
 - 16. Acceptability of substrates.

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- 17. Temporary facilities and controls.
- 18. Space and access limitations.
- 19. Regulations of authorities having jurisdiction.
- 20. Testing and inspecting requirements.
- 21. Installation procedures.
- 22. Coordination with other work.
- 23. Required performance results.
- 24. Protection of adjacent work.
- 25. Protection of construction and personnel.
- E. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

1.08 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: As appropriate to agenda topics for each meeting. Attendees shall be authorized to conclude matters relating to the Work.
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect.
 - 4. Contractor's Superintendent.
 - 5. Major Subcontractors and Suppliers.
- D. Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review Contractor's Construction Schedule and progress since last meeting.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems that impede, or will impede, planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of RFIs log and status of responses.
 - 7. Review of off-site fabrication and delivery schedules.
 - 8. Maintenance of progress schedule.
 - 9. Corrective measures to regain projected schedules.
 - 10. Planned progress during succeeding work period.
 - 11. Coordination of projected progress.
 - 12. Maintenance of quality and work standards.
 - 13. Effect of proposed changes on progress schedule and coordination.
 - 14. Other business relating to work.
 - 15. Review present and future needs of each entity present, including the following:
 - 16. Status of sustainable design documentation.
 - 17. Temporary facilities and controls.
 - 18. Progress cleaning.
 - 19. Status of Proposal Requests.
 - 20. Status of Change Orders.
 - 21. Pending claims and disputes.
 - 22. Documentation of information for payment requests.
- E. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

1.09 PROJECT CLOSEOUT MEETINGS

- A. Schedule and administer a project closeout meeting, at a time convient to the Owner and Architect, but no later than 90 days prior to the scheduled date of substantial completion.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: As appropriate to agenda topics for each meeting. Attendees shall be authorized to conclude matters relating to the Work.
 - 1. Contractor.
 - 2. Owner.
 - 3. Architect and their Consultants.
 - 4. Contractor's Superintendent.
 - 5. Major Subcontractors and Suppliers.
- D. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - 1. Preparation of record documents.
 - 2. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - 3. Submittal of written warranties.
 - 4. Requirements for preparing operations and maintenance data.
 - 5. Requirements for delivery of material samples, attic stock, and spare parts.
 - 6. Requirements for demonstration and training.
 - 7. Preparation of Contractor's punch list.
 - 8. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - 9. Submittal procedures.
 - 10. Coordination of separate contracts.
 - 11. Owner's partial occupancy requirements.
 - 12. Installation of Owner's furniture, fixtures, and equipment.
 - 13. Responsibility for removing temporary facilities and controls
- E. Contractor shall record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 3300 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A Shop Drawings, Product Data, Samples, and other submittals.
- B Requirements for submittal schedule

1.2 DEFINITIONS

- A Submittals for Review: Written and graphic information and physical samples that require Architect's responsive action.
- B Submittals for Information: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.
- 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.

1.3 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 revisions to submittals noted by 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. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.

- c. Name of subcontractor.
- d. Description of the Work covered.
- e. Scheduled date for Architect's final release or approval.
- f. Scheduled date of fabrication.
- g. Scheduled dates for purchasing.
- h. Scheduled dates for installation.
- i. Activity or event number.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 - c. The following digital data files will by furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.
- 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. 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.
 - b. Architect reserves the right to withhold action on a submittal requiring the Architect's concurrent review 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: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Construction Manager 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. Resubmittal Review: Allow 14 days for review of each resubmittal.
- 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.
 - a. [Insert list of Specification Sections requiring sequential review].
- 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 14 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01).
 Resubmittals shall include an numeric suffix after a dash (e.g., LNHS-061000.01-1).
 - 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 - 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - I. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.

- 5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- E Options: Identify options requiring selection by Architect.
- F Deviations and Additional Information: 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.
- G 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.
- H 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.
- Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- 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. PDF electronic file.
- 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. PDF electronic file.
 - 4. BIM File Incorporation: Develop and incorporate Shop Drawing files into Building Information Model established for Project.
 - a. Prepare Shop Drawings in the following format: Same digital data software program, version, and operating system as original Drawings.
 - b. Refer to Section 01 3100 Project Management and Coordination, for requirements for coordination drawings.

- 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 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.
 - e. Specification paragraph number and generic name of each item.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for qualitycontrol 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.
 - 5. 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 full set 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.
 - 6. 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 sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three 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 or assigned by Contractor if none is indicated.
 - 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.
- F Coordination Drawing Submittals: Comply with requirements specified in Section 01 3100 Project Management and Coordination.
- G Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 2900 Payment Procedures.
- H Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 Quality Requirements.
- I Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 Closeout Procedures.
- J Maintenance Data: Comply with requirements specified in Section 01 7823 Operation and Maintenance Data.
- K 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.
- L 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 AWS forms. Include names of firms and personnel certified.
- M 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.
- N 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.
- O Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

- Q 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.
- R Product Test Reports: Submit written reports indicating that 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.
- S 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.
- T 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.
- U 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.
- V Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- 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 digitally signed PDF electronic file 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.
- C BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.
 - 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

PART 3 EXECUTION

3.1 CONTRACTOR'S REVIEW

- A 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: See requirements in Section 01 7700 Closeout Procedures.
- 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 Approved with Comments as Noted: That part of the Work covered by the Submittal may proceed without further restriction, provided it conforms with any/all notations and corrections made on the Submittal and requirements of the Contract Documents. Resubmittal is not required, unless noted otherwise.
- B Revise and Resubmit: That part of the Work covered by the Submittal is considered to be in conformance with the design concept, provided notations and correction made on the Submittal are incorporated. Deficiencies in the Submittal are considered to be significant enough, however, to prevent that part of the Work from proceeding further until the Architect has reviewed the corrected Submittal and determined conformance. Resubmittal is required.
- C Not Reviewed: Submittal is not required by the Contract Documents and will not be reviewed by the Architect. The Submittal will not be returned. Work shall proceed in conformance with requirements of the Contract Documents.
- D For Information Only: Submittal is for informational purposes only as defined by section. No action required.
- E Rejected: That part of the Work covered by the Submittal is judged not in conformance with the design concept or information given in the Contract Documents and is restricted from proceeding until the Architect has reviewed the new or corrected Submittal and determined

conformance. Resubmittal is required. <u>END OF SECTION</u>

SECTION 01 4000 QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Tolerances.
- G. Special Test and Inspections.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 REFERENCE STANDARDS

- A. ASTM C1021 Standard Practice for Laboratories Engaged in Testing of Building Sealants.
- B. ASTM C1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- C. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- F. ASTM E543 Standard Specification for Agencies Performing Nondestructive Testing.
- G. ASTM E699 Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.
- H. IAS AC89 Accreditation Criteria for Testing Laboratories.

1.03 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.
- D. Field Quality-Control Tests: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- E. Pre-Construction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance

with specified criteria.

- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. 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.
- I. 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.

1.04 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements are specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction 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.

1.05 SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2. Include required product data and shop drawings.
 - 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect, Commissioning Authority, and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.

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- h. Date of test/inspection.
- i. Results of test/inspection.
- j. Compliance with Contract Documents.
- k. When requested by Architect, provide interpretation of results.
- 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.
- H. Permits and Licenses: Submit for Owner's records, permits, licenses, releases, jurisdictional settlements, notices, receipts for fee payment, judgements, correspondence, records, and similar documents, established for compliance with standards and regulations bearingon performance of Work.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Construction Manager by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.

- 1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.
- b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Process control.
 - 6) Inspection and testing procedures and scheduling.
 - 7) Control of noncomplying work.
 - 8) Tracking deficiencies from identification, through acceptable corrective action, and verification.
 - 9) Control of testing and measuring equipment.
 - 10) Project materials certification.
 - 11) Managerial continuity and flexibility.
- c. Owner will not make a separate payment for providing and maintaining a Quality Control Plan. Include associated costs in Bid price.
- d. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.
- D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.07 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ services of an independent testing agency to perform certain specified testing indicated as Owner's responsibility.
 - 1. Owner will furnish Contractor with name, address, and telephone number of testing agencies engaged, and the types of testing and inspection they are 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 and the Contract Sum adjusted by Change Order.
- B. Owner will employ and pay for services of an independent testing agency to perform other specified testing and inspection.

- C. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing and inspection not explicitly assigned to Owner, and those required by authorities having jurisdiction.
 - 1. Contractor shall not employ same testing and inspection agency as Owner.
- D. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- E. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- F. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection Agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 4. Laboratory: Authorized to operate in the State in which the Project is located.
 - 5. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 6. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect, Commissioning Authority, and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

- 5. Promptly notify Architect, Commissioning Authority, and Contractor of observed irregularities or non-conformance of Work or products.
- 6. Perform additional tests and inspections required by Architect.
- 7. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Coordinate sequence of activities required to accomodate quality assurance and quality control activities with minimum delay to avoid removal and replacement of completed work for testing and inspection.
 - 2. Prepare schedule of tests, inspections, and similar quality control activities required. Update as Work progresses. Distribute to Architect, Owner, Commissioning Authority, testing agency, and other parties involved in where testing and inspection are required.
 - 3. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 4. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 5. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 6. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 7. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 8. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 TEST AND INSPECTION LOG

- A. Test and Inspection Log: 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 revisions as they occur. Provide access to test and inspection log for Architect's and Commissioning Authority's reference during normal working hours.
 - 1. Indicate corrective action taken to bring non-conforming work into compliance with specified requirements.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and

balance equipment as applicable, and to initiate instructions when necessary.

- B. Submit qualifications of observer to Architect 30 days in advance of required observations.
 - 1. Observer subject to approval of Architect.
 - 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

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

END OF SECTION

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SECTION 01 4216 DEFINITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Supplements to the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Alternate Price: A variation to the Base Bid amount stated on the Proposal Form to cover a variation in the Contract Requirements. If the Alternate Price is accepted by the Owner, the variation becomes a part of the Contract, and the amount quoted is then added to, or deducted from, the Lump Sum Base Bid amount to determine the Contract Sum. Variations may include a change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
- C. Approved: When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- D. Base Bid: The Bid amount before any Alternate Price or Substitution is considered.
- E. Bid: A Proposal prepared and submitted as required herein.
- F. Complete: Where used, it shall mean "Complete with connections, supports, attachments, and incidental items necessary for a finished and properly operating assembly or operation".
- G. Connect: The term shall mean "to bring service(s) to point of installation and make final connections of the service(s) to the installed equipment, and provide miscellaneous auxiliary appurtenances necessary to make operable for its intended use."
- H. Contract Documents: Drawings and Specifications setting forth in detail the requirements for construction of the Project.
- I. Days and/or Calendar Days: Days listed on the calendar, including Saturdays, Sundays, and legal holidays where the Project is located.
- J. Directed: Terms such as "directed", "requested", "authorized", "selected", "approval", "satisfactory", "accepted", "required", and "permitted" are used without reference to specific entity, they shall mean "as directed by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Owner's or Architect's responsibility into the Contractor's area of construction supervision, administration, means, or methods.
- K. Drawing: Plans and detail drawings, both large and small scale, furnished by the Architect for the purpose of giving instructions and showing the Work to be done.
- L. Experienced: Unless otherwise defined in the technical specifications, means having successfully completed a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with the requirements of authorities having jurisdiction.
- M. Furnish: To supply, deliver, unload, unpack, and assemble ready for installation at the Project site, and inspect for damage.
- N. Hours of Work: Standard hours of work for the Project shall be proposed by the Subcontractor, subject to approval of the Construction Manager, and shall be for all standard working days. Hours of work other than these "standard hours of work" will be considered "premium time hours" and shall include, if any, cost penalty.
- O. Indicated: Graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in specifications, and similar requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used, it is to help locate the reference. No limitation on location is intended except as specifically noted.

- P. Install: To unload, temporarily store, distribute, uncrate, unpack, assemble, erect, apply, anchor into the intended final positions, finish, cure, protect, clean, start up, and make ready for use. Installer shall provide all miscellaneous hardware and supplies required to anchor and support securely, connect, clean-up, and dispose of rubbish.
- Q. Installer: The Contractor or entity engaged by the Contractor, as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
- R. Not-In-Contract / NIC: Work not included in this Contract.
- S. Per: "in accordance with the requirements of".
- T. Plan(s): The terms shall read to mean "Contract Drawings".
- U. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- V. Project: The total construction of which the work performed under the Contract Documents may be the whole or a part.
- W. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- X. Project Site / Site: The space available for the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the drawings and may or may not be identical with the description of the land upon which the Project is to be built.
- Y. Provide: To furnish, install, and connect, complete and ready for intended use.
- Z. Regulations: Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- AA. Request for Information (RFI): A request for information by the Contractor to the Architect of Record for clarification of intent of any portion of the Contract Documents after the Award of Contract and during the construction of the Project.
- BB. Supply: Same as Furnish.
- CC. Supplier: As used herein; A firm or organization furnishing or delivering products directly to the jobsite, and because of such direct delivery, could be construed under the lien laws of the State in which the work is being performed as having lien rights against funds due the Contractor. Suppliers of materials and equipment, delivering to Contractor or Subcontractor on an open account basis and not having lien rights on the Work, will not be considered suppliers within the meaning of the Contract Documents.
- DD. Testing Agency: An independent entity engaged to perform specific inspections or tests, at the project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- EE. Trades: The use of titles such as "Carpentry" is not intended to 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 tradespersons of the corresponding generic name.
- FF. Trade Specialists: Certain Sections of the Specifications require that specific construction activities be performed by specialists who are recognized experts in the operations to be performed. The Specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option.
- GG. Work: (Capitalized) The construction services required by the Contract Documents, whether completed or partially completed, and including all other labor, materials, equipment and other

services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or part of the Project.

- HH. work: (Lower Case) Activity to do or perform something, a specific task being a part or phase of some larger activity, or something that results from a particular manner or method, working, operating, or devising.
- II. Working Days: Standard working days for the Project shall be all calendar days except Saturdays, Sundays, and legal holidays where the Project is located and shall invoke no cost or time penalties. Working days other than "standard working days" will be considered "premium working days" and shall include, if any, cost penalty.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 4533 SPECIAL INSPECTION REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Administrative and procedural requirements for special inspections and the Special Inspector.
- B. Special inspection services are required to verify compliance with requirements for inspections specified or indicated. These services do not relieve the Construction Manager or Contractor of responsibility for compliance with the Contract Document requirements.
- C. Statement of Structural Special Inspections: As indicated on Drawings.

1.02 DEFINITIONS

- A. Approved Agency: A firm that is approved by the Code Enforcement Official (CEO) and independent of the Project Contractor and Subcontractors, has adequate equipment for the Work, and employs experienced and certified personnel.
- B. Special Inspector: An individual having required qualifications and authorized by the Code Enforcement Official (CEO) to perform or witness particular special inspections required by the code or by the rules of the Code Enforcement Official (CEO) including but not limited to a registered qualified design professional so authorized.
- C. Special Inspection: Inspection of selected materials, equipment, installation, fabrication, erection, or placement of components and connections, to ensure compliance with approved construction documents and referenced standards required by code or its referenced standards.
- D. Special Inspection, Continuous: The full-time observation of work requiring special inspection by a Special Inspector who is continuously present in the area where the work is being performed.
- E. Special Inspection, Periodic: The intermittent observation of work requiring special inspection by a special inspector where the work has been or is being performed and at the completion of the work. All work requiring special inspection shall remain accessible and exposed until approved by the Special Inspector.

1.03 SUBMITTALS

- A. 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 inspecting agency.
 - 4. Dates and locations of inspections.
 - 5. Names of individuals making inspections.
 - 6. Description of the Work 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 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 inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- C. Final Report of Special Inspections: Documenting that all required Special Inspections have been completed and correction of discrepancies noted in inspections have been confirmed.

This document is required to allow issuance of a Certificate of Use and Occupancy.

1.04 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A licensed professional engineer 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 similar to those indicated for this Project in material, design, and extent.
- B. Special Inspector Qualifications: Special Inspector shall be a licensed professional engineer or an individual certified as a Special Inspector by a nationally recognized Federal, State, or Code Authority. The Special Inspector shall have demonstrated competence, to the satisfaction of Authority Having Jurisdiction, for inspection of the types of construction indicated for this project and as defined in these Specifications. Duties of the Special Inspector are independent from the construction quality services indicated in other Specification sections.
 - 1. Minimum qualifications of Special Inspector or designee of Special Inspector are listed in the Table at the end of this Section.

1.05 OWNER RESPONSIBILITIES

- A. Owner will engage a qualified testing and inspecting agency to perform these services.
- B. 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.

1.06 CONTRACTOR AND CONSTRUCTION MANAGER RESPONSIBILITIES

- A. Cooperate with personnel performing required tests and inspections and provide reasonable auxiliary services as requested. Notify testing and inspection agency not less than seven days prior to start of construction operations to allow 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. Security and protection for samples and for testing and inspecting equipment at Project site.
- B. Coordination: Coordinate sequence of activities to accommodate required special inspections with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
- C. Correct deficiencies in the Work that test reports and inspections indicate does not comply with the Contract Documents.
- D. Costs for retesting and reinspecting construction that replaces or is necessitated by work that fails to comply with the Contract Documents will be paid for by the Contractor.

1.07 SPECIAL INSPECTOR RESPONSIBILITIES

- A. Cooperate with Contractor and Architect in performance of required tests and inspections. Provide qualified personnel to perform tests and inspections.
- B. Notify Contractor and Architect promptly of irregularities or deficiencies observed in the Work during performance of duties.
- C. Special Inspector is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
- D. Special Inspector shall not perform duties of the Contractor.
- E. Provide Final Report of Special Inspections that document that all required Special Inspections have been completed and correction of discrepancies noted in inspections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEST AND INSPECTION LOG

- A. Special Inspector shall 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, Owner's, Construction Manager's, and Contractor's reference during normal working hours.

3.02 DISCREPANCY LOG

- A. Prepare and maintain a record of all inspections and tests which do not conform to specifications or project documentation. Include the following:
 - 1. Test or report number.
 - 2. Date test or inspection was conducted.
 - 3. Description of test or inspection which did not conform to specification including specific locations and quantities.
 - 4. Reference to specification, standard or project documentation.
 - 5. Date discrepancy notice was transmitted to Architect and Construction Manager.
 - 6. Description of corrective action, approved by Architect, to resolve discrepancy.
 - 7. Retest or reinspection report number.
 - 8. Date retest or reinspection was conducted.
 - 9. Identification of Architect approving and closing discrepancy.
 - 10. Date discrepancy was approved and closed.
- B. Discrepancy Log at Project Site: Special Inspector shall maintain a discrepancy log; post changes and modifications as they occur. Provide access to discrepancy log for Architect's, Owner's, Construction Manager's, and Contractor's reference during normal working hours

3.03 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for cutting and patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility.

3.04 SCHEDULE OF SPECIAL INSPECTOR QUALIFICATIONS

Category	Code	Minimum Qualifications
	Reference	
*Reinforced Concrete	1705.3	 Current ICC Reinforced Concrete Special Inspector or ACI Concrete Construction Inspector. Concrete field testing can be by an ACI Concrete Field Testing Technician with Grade 1 Certification. Engineer-in-Training (EIT) with relevant experience. Professional Engineer (P.E.) with relevant
		experience.
Welding	1705.2,	1. Curent AWS Certified Welding Inspector.

Category	Code	Minimum Qualifications
	Reference	
	1705.3	2. Current ICC Structural Steel and Welding
		certificate plus one year of relevant experience.
		3. Current Level II certification from the American
		Society for Nondestructive Testing (NDT).
		4. Current NDT Level III provided previously
		certified as NDT Level II.
High-strength	1705.2	1. Current ICC Structural Steel and Welding
Bolting &		certificate and one year of relevant experience.
Steel Frame		2. EIT with relevant experience.
Inspection		3. P.E. with relevant experience.
Masonry	1705.4	1. Current ICC Structural Masonry certificate and
		one year of relevant experience.
		2. EIT with relevant experience.
		3. P.E. with relevant experience.
Spraved Fire-	1705.14.	1. Current ICC Sprav-Applied Fire Proofing
Resistant	1705.15	certificate and one year of relevant experience.
Materials		2. EIT with relevant experience.
		3. P.E. with relevant experience.
Excavation	1705.6.	1. Current Level II certification in geotechnical
and Filling	1705 7	engineering technology/construction from the
Verification of	1705.8	National Institute for Certification in Engineering
Soils: Piling &	1705.9	Technologies (NICET)
Drilled Piers	1705.10	2 FIT with relevant experience
Modular	1700.10	3 P.F. with relevant experience
Retaining		
Walls		
Wind &	1705 10	1 P F with relevant experience
Sesimic	1705.13	
Resistance	1705.14	
Exterior and		1 P F with relevant experience
Interior		2 FIT with relevant experience
Architectural		
Wall Panels		
Exterior	1705 16	1. RDP with relevant experience
Insulation		2. EIT with relevant experience.
and Finish		
System		
** Smoke	1705 19	1 The RDP responsible for design
Control		
		1

* Note: ACI has certifications for both field testing technicians and laboratory technicians.

**Certifications from National Environmental Balancing Bureau are available for this activity.

END OF SECTION

SECTION 01 5000 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary telecommunications services.
- C. Temporary sanitary facilities.
- D. Temporary fire protection.
- E. Mold and moisture control.
- F. Waste removal facilities and services.
- G. Project identification sign.
- H. Field offices.

1.02 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.03 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

1.04 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Fire-Safety Program: Show compliance with requirements of NFPA 241.
- C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, and describe plans for dealing with water from these operations.
- D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative indicating the dustand 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.

1.05 TEMPORARY UTILITIES

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

1.06 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
 - 1. Include temporary toilets, wash facilities, and drinking water for use by construction personnel.
- B. New permanent facilities may not be used during construction operations.

- C. Maintain daily in clean and sanitary condition.
- D. At end of construction, return facilities to same or better condition as originally found.

1.08 TEMPORARY FIRE PROTECTION

- A. Temporary Fire Protection: Install and maintain temporary fire-protection facilities. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
 - 3. Develop an overall fire-prevention and -protection program for personnel at Project site. Meet with local fire department and establish procedures. Instruct personnel in methods and procedures. Post warnings and information.

1.09 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-ofway and for public access to existing building.
- C. Maintain egress from existing facilities as required by authorities having jurisdiction.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.10 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks. Maintain security by restricting distribution of keys. Provide Owner with one set of keys.

1.11 EXTERIOR ENCLOSURES

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

1.12 PEST CONTROL

A. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

1.13 MOLD AND MOISTURE CONTROL

- A. Contractor's Moisture-Protection Plan: Develop procedures and controls to avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores.
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Remove standing water from decks.
- C. 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.
 - 1. Keep interior spaces reasonably clean and protected from water damage.
 - 2. Discard or replace water-damaged material.
 - 3. Do not install wet material.

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- 4. Discard, replace, or clean stored or installed material that begins to grow mold.
- 5. Perform work in sequence to allow any wet materials adequate time to dry before enclosing the material.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems.
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsumbased products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

1.14 SECURITY

A. Coordinate with Owner's security program.

1.15 VEHICULAR ACCESS AND PARKING

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

1.16 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.17 PROJECT IDENTIFICATION

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

1.18 FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 12 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.19 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Remove temporary roads and paved areas. Repair or replace pavement at temporary entrances.

- D. Clean and repair damage caused by installation or use of temporary work.
- E. Restore existing facilities used during construction to original condition.
- F. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 5719 TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Construction procedures to promote adequate indoor air quality after construction.
- B. Building flush-out after construction and before occupancy.
- C. Testing indoor air quality after completion of construction.
- D. Testing air change effectiveness after completion of construction.

1.02 PROJECT GOALS

- A. See Section 01 3566.05 Project Sustainability Goal Credit Summary LEED v4, for overall project goals relating to environment and energy.
- B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.
 - 1. Cleaning of ductwork is not contemplated under this Contract.
 - 2. Construction Manager shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.
- C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
 - 1. Furnish products meeting the specifications.
 - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

1.03 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. ASHRAE Std 129 Measuring Air-Change Effectiveness.
- C. ASTM D5197 Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Air (Active Sampler Methodology).
- D. CAL (CDPH SM) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- E. EPA 600/4-90/010 Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
- F. EPA 625/R-96/010b Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.
- G. SMACNA (OCC) IAQ Guidelines for Occupied Buildings Under Construction.

1.04 DEFINITIONS

- A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

- A. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.
 - 1. Submit not less than 60 days before enclosure of building.
 - 2. Identify potential sources of odor and dust.

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- 3. Identify construction activities likely to produce odor or dust.
- 4. Identify areas of project potentially affected, especially occupied areas.
- 5. Evaluate potential problems by severity and describe methods of control.
- 6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
- 7. Describe cleaning and dust control procedures.
- 8. Describe coordination with commissioning procedures.
- B. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.
- C. Duct and Terminal Unit Inspection Report.
- D. Air Contaminant Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Locations and scheduling of air sampling.
 - 3. Test procedures, in detail.
 - 4. Test instruments and apparatus.
 - 5. Sampling methods.
- E. Air Contaminant Test Reports: Show:
 - 1. Location where each sample was taken, and time.
 - 2. Test values for each air sample; average the values of each set of 3.
 - 3. HVAC operating conditions.
 - 4. Certification of test equipment calibration.
 - 5. Other conditions or discrepancies that might have influenced results.
- F. Ventilation Effectiveness Test Plan: Identify:
 - 1. Testing agency qualifications.
 - 2. Description of test spaces, including locations of air sampling.
 - 3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
 - 4. Test instruments and apparatus; identify tracer gas to be used.
 - 5. Sampling methods.
- G. Ventilation Effectiveness Test Reports: Show:
 - 1. Include preliminary tests of instruments and apparatus and of test spaces.
 - 2. Calculation of ventilation effectiveness, E.
 - 3. Location where each sample was taken, and time.
 - 4. Test values for each air sample.
 - 5. HVAC operating conditions.
 - 6. Other information specified in ASHRAE Std 129.
 - 7. Other conditions or discrepancies that might have influenced results.

1.06 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Low VOC Materials: See other sections for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters: MERV of 8, minimum, when tested in accordance with ASHRAE Std 52.2.

PART 3 EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by adsorptive materials by:
 - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.

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- 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
- 3. Provide sufficient ventilation for drying within reasonable time frame.
- B. Begin construction ventilation when building is substantially enclosed.
- C. HVAC equipment and supply air ductwork may be used for ventilation during construction:
 - 1. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.
 - 2. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.
 - 3. Do not use return air ductwork for ventilation unless absolutely necessary.
 - 4. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.
- D. Do not store construction materials or waste in mechanical or electrical rooms.
- E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.
 - 1. Inspect duct intakes, return air grilles, and terminal units for dust.
 - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
 - 3. Clean tops of doors and frames.
 - 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
 - 5. Clean return plenums of air handling units.
 - 6. Remove intake filters last, after cleaning is complete.
- F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.
- G. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

3.02 BUILDING FLUSH-OUT

- A. Construction Manager's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.
- B. Perform building flush-out before occupancy.
- C. Do not start flush-out until:
 - 1. All construction is complete.
 - 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.
 - 4. New HVAC filtration media have been installed.
- D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.
 - 1. Obtain Owner's concurrence that construction is complete enough before beginning flushout.
 - 2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.
 - 3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.
 - 4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 25 percent of the total air volume prior to occupancy, and:
 - a. Begin ventilation at least three hours prior to daily occupancy.
 - b. Continue ventilation during all occupied periods.
 - c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.03 AIR CONTAMINANT TESTING

- A. Construction Manager's Option: Either full continuous flush-out, or satisfactory air contaminant testing is required, not both.
- B. Perform air contaminant testing before occupancy.
- C. Do not start air contaminant testing until:
 - 1. All construction is complete, including interior finishes.
 - 2. HVAC systems have been tested, adjusted, and balanced for proper operation.
 - 3. New HVAC filtration media have been installed.
- D. Indoor Air Samples: Collect from spaces representative of occupied areas:
 - 1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.
 - 2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet; take samples from areas having the least ventilation and those having the greatest presumed source strength.
 - 3. Collect samples from height from 36 inches to 72 inches above floor.
 - 4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.
 - 5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.
 - 6. When retesting the same building areas, take samples from at least the same locations as in first test.
- E. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.
- F. Analyze air samples and submit report.
- G. Air Contaminant Concentration Limits:
 - 1. Formaldehyde: Not more than 27 parts per billion.
 - 2. PM10 Particulates: Not more than 50 micrograms per cubic meter.
 - 3. Total Volatile Organic Compounds (TVOCs): Not more than 500 micrograms per cubic meter.
 - 4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: Allowable concentrations listed in Table 4-1.
 - 5. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.
- H. Air Contaminant Concentration Test Methods:
 - 1. Formaldehyde: ASTM D5197, EPA 625/R-96/010b Method TO-11A, or EPA 600/4-90/010 Method IP-6.
 - 2. Particulates: EPA 600/4-90/010 Method IP-10.
 - 3. Total Volatile Organic Compounds (TVOC): EPA 625/R-96/010b Method TO-1, TO-15, or TO-17; or EPA 600/4-90/010 Method IP-1.
 - 4. Chemicals Listed in CAL (CDPH SM) Table 4-1, except Formaldehyde: ASTM D5197, or EPA 625/R-96/010b Method TO-1, TO-15, or TO-17.
 - 5. Carbon Monoxide: EPA 600/4-90/010 Method IP-3, plus measure outdoor air; measure in ppm; report both indoor and outdoor measurements.
- I. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

3.04 VENTILATION EFFECTIVENESS TESTING

- A. Perform ventilation effectiveness testing before occupancy.
- B. Do not begin ventilation effectiveness testing until:

- 1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
- 2. Building flush-out or air contaminant testing has been completed satisfactorily.
- 3. New HVAC filtration media have been installed.
- C. Test each air handler zone in accordance with ASHRAE Std 129.
- D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to Owner.

END OF SECTION

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SECTION 01 6000 PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selection of products for use in Project.
- B. Product delivery, storage, and handling.
- C. Manufacturers' standard warranties on products.
- D. Special warranties.
- E. Comparable products.

1.02 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work. 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, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged or recycled products 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.

1.03 SUBMITTALS

- A. 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 requirements specified in "Comparable Products" Article.
 - Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Construction Manager, through Construction Manager of approval or rejection of request within 14 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 01 3300 Submittal Procedures.
 - b. Use specified product if Architect does not issue a decision on use of comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 3300 Submittal Procedures. Show compliance with requirements.

1.04 QUALITY ASSURANCE

- A. Compatibility of Options: If Construction Manager is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

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1.05 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.
 - 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 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 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. Protect 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.
- 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.06 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 Construction Manager 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, use indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 7700 Closeout Procedures.

PART 2 PRODUCTS

2.01 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

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- 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.
- B. Product Selection Procedures:
 - 1. Product: Where Specifications name a single manufacturer and product, provide the named product. Comparable products or substitutions for Construction Manager's convenience will not be considered.
 - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide product by named manufacturer or source that complies with requirements. Comparable products or substitutions for Construction Manager's convenience will be considered.
 - 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Construction Manager's convenience will be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one 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 of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 - 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 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 of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide 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 2500 Substitution Procedures, 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.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Construction Manager'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:

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- 1. Evidence the proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents and will produce the indicated results, and 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

SECTION 01 7123 FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Construction layout.
- B. Field engineering and surveying.
- C. Land surveying and construction layout services by Construction Manager.

1.02 SUBMITTALS

- A. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit two copies of certificate signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- B. Final Property Survey: Submit 10 copies, or an electronic copy, showing the Work performed and record survey data.
 - 1. Structure locations from property lines, and distancesto adjacent buildings.
 - 2. Dimensions and locations of drives, walks, walls, underground utilites, appurtenances, and major site features.
 - 3. Location of easements.
 - 4. Final grading toppgraphic survey.

1.03 QUALITY ASSURANCE

- A. Land Surveyor's Qualifications: Employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. Field Engineer's Qualifications: Employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- C. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks. Notify Owner and Architect of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.
- B. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

3.02 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 damaged, 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 damaged, 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 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 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.

3.03 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 Construction Manager promptly.
- B. General: Engage a land surveyor 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 and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
 - a. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without Owner's concurrence of remediation plan.
 - 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 rim 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 and Construction Manager.
 - 1. Make the log available for reference by Architect and Construction Manager.

3.04 RECORDS

- A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.
 - 1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Construction Manager's surveyor's original field notes, computations, and other surveying data in Construction Manager-furnished hard-bound field books. Construction Manager is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, (including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
 - 2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.
- B. Final Property Survey: Final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey. Include the following information:
 - 1. Structure locations from property lines, and distances to adjacent buildings.
 - 2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, and major site features.
 - 3. Location of easements.
 - 4. Final grading topographic survey.
 - 5. Recording: At Substantial Completion, have final property survey recorded by or with authorities having jurisdiction as the official "property survey."

END OF SECTION

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SECTION 01 7300 EXECUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Installation of the Work.
- B. Coordination of Owner-installed products.
- C. Progress cleaning.
- D. System start-up.
- E. Protection of installed work.

1.02 REFERENCE STANDARDS

- A. ICC (IBC) International Building Code.
- B. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.03 QUALITY ASSURANCE

A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

1.04 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- C. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
- E. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

PART 2 PRODUCTS

2.01 MATERIALS

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

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility required 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.

3.03 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 per ICC (IBC) in occupied spaces and unoccupied spaces.
- 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to 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.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 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.
- I. 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.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.04 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Construction Manager'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. Pre-Installation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.05 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 degF.
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally.
 - a. Use containers intended for holding waste materials of type to be stored.
 - 4. Coordinate progress cleaning for joint-use areas where Construction Manager and other contractors are working concurrently.
- 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.

- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed. Use non-hazardous cleaning materials.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure no damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 7419 Construction Waste Management and Disposal.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure no 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.

3.06 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Construction Manager personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations until Substantial Completion.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Prohibit traffic from landscaped areas.
- H. Remove protective coverings when no longer needed, reuse or recycle plastic coverings when possible.

END OF SECTION

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SECTION 01 7419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Construction Manager shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- E. Construction Manager shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
 - 5. Incineration, either on- or off-site.
- G. Regulatory Requirements: Construction Manager is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

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

- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

- A. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.
- B. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

- 5. Material Reused on Project: Include the following information for each:
 - a. Identification of material and how it was used in the project.
 - b. Amount, in tons or cubic yards.
 - c. Include weight tickets as evidence of quantity.
- 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- D. Recycling Incentive Programs:
 - 1. Where revenue accrues to Construction Manager, submit copies of documentation required to qualify for incentive.
 - 2. Where revenue accrues to Owner, submit any additional documentation required by Owner in addition to information provided in periodic Waste Disposal Report.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

- A. See Section 01 6000 Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- B. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
 - 4. Job safety meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
 - 3. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
 - 4. Locate enclosures out of the way of construction traffic.
 - 5. Provide adequate space for pick-up and delivery and convenience to subcontractors.

- 6. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7700 CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Substantial Completion procedures.
- B. Final completion procedures.
- C. Warranties.
- D. Final cleaning.
- E. Repair of the Work.

1.02 SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.
- D. Certificates of Release: From authorities having jurisdiction.
- E. Certificate of Insurance: For continuing coverage.
- F. Field Report: For pest control inspection.
- G. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.03 SUBSTANTIAL COMPLETION PROCEDURES

- A. Construction Manager's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Construction Manager's punch list), indicating the value of each item, and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following minimum 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following minimum 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.

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- 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
- 3. Complete startup and testing of systems and equipment.
- 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
- 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 7900 Demonstration and Training.
- 6. Advise Owner of changeover in heat and other utilities.
- 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
- 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
- 9. Complete final cleaning requirements, including touchup painting.
- 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion minimum 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Construction Manager of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Construction Manager, through the Construction Manager, of items, either on Construction Manager'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.

1.04 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit final Application for Payment according to Section 01 2900 Payment Procedures.
 - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance minimum 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Construction Manager of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Construction Manager of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when Work identified in previous inspections as incomplete is completed or corrected.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Identify each space and area, by name and room number, affected by construction operations for incomplete items and items needing correction including, areas disturbed by Construction Manager that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.

- b. Date.
- c. Name of Architect and Construction Manager.
- d. Name of Construction Manager.
- e. Page number.
- 4. Submit list of incomplete items in the following format:

1.06 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. 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 Construction Manager.
- C. Organize warranty documents into an orderly sequence based on the Project Manual table of contents.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit on digital media acceptable to the Architect.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 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

3.01 FINAL CLEANING

- A. General: Perform 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 designated 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. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

- i. Clean transparent materials, including mirrors and glass. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
- j. Remove labels that are not permanent.
- k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- I. Clean plumbing fixtures to a sanitary condition, free of stains.
- m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- o. Clean HVAC system in compliance with NADCA ACR 2013. Provide written report on completion of cleaning.
- p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 01 5000 Temporary Facilities and Controls. Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 5000 Temporary Facilities and Controls.

3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 7839 PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Record Drawings.
- B. Record Specifications.
- C. Record Product Data.
- D. Miscellaneous record submittals.

1.02 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit Record Digital Data files and one set(s) of plots.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit record digital data files and two sets of record digital data file plots.
 - 2) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDFelectronic files and directories of each submittal.
 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous recordkeeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

1.03 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 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 provide information for preparation of corresponding 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 acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. 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.

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- k. Changes made following Architect's written orders.
- I. 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 and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
- 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 Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings.
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.
 - 4. Architect will furnish Construction Manager one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 01 3300 Submittal Procedures, for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. 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 Digital Data Files: Organize digital data 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 digital data file.
 - 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Construction Manager.

1.04 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installed where installation varies from that indicated in Specifications.
 - 1. Include product substitutions, alternates utilized, changes made by Addenda, and other contract modifications.
 - 2. Note related Change Orders, and record Project Data, and record Drawings where applicable.
 - 3. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 4. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 5. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
- B. Format: Submit record Specifications as annotated PDF electronic file.

1.05 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. 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.
- C. Format: Submit record Product Data as annotated PDF electronic file.
 - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.06 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.
- B. Format: Submit miscellaneous record submittals as PDF electronic file.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.07 MAINTENANCE OF RECORD DOCUMENTS

A. 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 9113 GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Construction Manager's responsibilities for commissioning:
 - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Construction Manager are utilized to achieve this.
 - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Construction Manager and witnessed by the Commissioning Authority are utilized to achieve this.
 - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Construction Manager are utilized to achieve this.
 - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Construction Manager is utilized to achieve this.
- B. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
 - 1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
 - 2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
 - 3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
 - 1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

- A. Commissioning Authority has prepared the Commissioning Plan.
 - 1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
 - 2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Construction Manager is responsible for compliance with the Commissioning Plan.

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- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
 - 1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
 - 2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
 - 3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
 - 4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

3.03 PREFUNCTIONAL CHECKLISTS

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
 - 1. No sampling of identical or near-identical items is allowed.
 - 2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
 - 3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
 - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
 - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
 - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
 - d. Serial number of installed unit.
 - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
 - f. Sensor and actuator calibration information.
- B. Construction Manager is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
 - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
 - 2. Checklists with incomplete items may be submitted for approval provided the Construction Manager attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
 - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Construction Manager shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
 - 4. If any Checklist line item is not relevant, record reasons on the form.
 - 5. Construction Manager may independently perform startup inspections and/or tests, at Construction Manager's option.

- 6. Regardless of these reporting requirements, Construction Manager is responsible for correct startup and operation.
- 7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Construction Manager.
 - 1. Initial Drafts: Construction Manager is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
 - 2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
 - 3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
 - 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
 - 1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
 - 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
 - 1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.04 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Construction Manager is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Construction Manager is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Construction Manager's stated intentions regarding correction.
 - 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
 - 2. When the deficiency has been corrected, the Construction Manager completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Construction Manager shall re-test.
 - 3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
 - 4. Construction Manager shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
 - 5. Construction Manager shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Construction Manager shall bear the cost of the second and subsequent re-tests.
- E. Functional Test Procedures:

- 1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Construction Manager.
- 2. Examples of Functional Testing:
 - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
 - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
 - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
 - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Construction Manager's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
 - 1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
 - 2. Verify that sensors with shielded cable are grounded only at one end.
 - 3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
 - 4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters Standard Application:
 - 1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
 - 2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
 - 3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters Standard Application.
 - 1. Disconnect sensor.
 - 2. Connect a signal generator in place of sensor.
 - 3. Connect ammeter in series between transmitter and building automation system control panel.
 - 4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
 - 5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
 - 6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.

- 7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
- 8. Reconnect sensor.
- 9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
- 10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
- 11. If not, replace sensor and repeat.
- 12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
 - 1. Watthour, Voltage, Amperage: 1 percent of design.
 - 2. Pressure, Air, Water, Gas: 3 percent of design.
 - 3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
 - 4. Relative Humidity: 4 percent of design.
 - 5. Barometric Pressure: 0.1 inch of Hg.
 - 6. Flow Rate, Air: 10 percent of design.
 - 7. Flow Rate, Water: 4 percent of design.
 - 8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
 - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 - 2. Set pump/fan to normal operating mode.
 - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 - 4. Command valve/damper to open; verify position is full open and adjust output signal as required.
 - 5. Command valve/damper to a few intermediate positions.
 - 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
 - 1. With full pressure in the system, command valve closed.
 - 2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
 - 1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
 - 2. Sampling is not allowed for:
 - a. Major equipment.
 - b. Life-safety-critical equipment.
 - c. Prefunctional Checklist execution.
 - 3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.

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- 4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
- 5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
- 6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
- 7. If YY percent of the units in the second sample fail, test all remaining identical units.
- 8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Construction Manager to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
 - 1. All points that are monitored by the relevant control system shall be trended by Construction Manager; at the Commissioning Authority's request, Construction Manager shall trend up to 20 percent more points than specified at no extra charge.
 - 2. Other points will be monitored by the Commissioning Authority using dataloggers.
 - 3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
 - 4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
 - 5. Graphical output is desirable and is required for all output if the system can produce it.
 - 6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 7800 Closeout Submittals for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION

SECTION 02 4100 DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Abandonment and removal of existing utilities and utility structures.
- C. Salvaging items for reuse by Owner

1.02 DEFINITIONS

- A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.
- B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.03 REFERENCE STANDARDS

- A. ANSI/ASSE A10.6 Safety & Health Program Requirements for Demolition Operations
- B. NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.04 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Construction Manager.

1.05 PRE-INSTALLATION MEETINGS

- A. Pre-Demolition Meeting: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review procedures for noise control and dust control.
 - 4. Review procedures for protection of adjacent buildings.
 - 5. Review items to be salvaged and returned to Owner.
 - 6. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 7. Review areas where existing construction is to remain and requires protection.

1.06 SUBMITTALS

- A. Site Plan: Indicate:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
 - 3. Areas for temporary and permanent placement of removed materials.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Summary of safety procedures.
 - 3. Demolition firm qualifications.
- C. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and noise control. Indicate proposed locations and construction of barriers

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- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
- E. Qualification Data: For refrigerant recovery technician.
- F. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- G. Predemolition Photographs or Video: Submit before Work begins.
- H. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- I. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.07 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

1.08 FIELD CONDITIONS

- A. Buildings immediately adjacent to demolition area will be occupied. Conductv demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.09 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 PRODUCTS

2.01 PEFORMANCE REQUIREMENTS

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

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.

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- 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
- 5. Provide, erect, and maintain temporary barriers and security devices.
- 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
- 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
- 8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
- 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
- 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- E. Protect existing structures and other elements to remain in place and not removed.
 - 1. Prevent movement or settlement of adjacent structures.
 - 2. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Hazardous Materials:
 - 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
- H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.02 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.03 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw

cuts.

- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.04 DEBRIS AND WASTE REMOVAL

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and dispose of legally in an EPA-approved landfill.
- B. Remove debris, junk, and trash from site.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Burning: Do not burn demolished materials.
- D. Remove from site all materials not to be reused on site; comply with the requirements of Section 01 7419 Construction Waste Management.
- E. Leave site in clean condition, ready for subsequent work.
- F. Clean up spillage and wind-blown debris from public and private lands.

3.05 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 03 3000 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Walls and piers.
 - 3. Slabs-on-grade.

1.02 REFERENCE STANDARDS

- A. AASHTO M 182 Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
- B. AASHTO T 260 Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
- C. ACI 117 Specification for Tolerances for Concrete Construction and Materials.
- D. ACI 301 Specifications for Concrete Construction.
- E. ACI 302.1R Guide to Concrete Floor and Slab Construction.
- F. ACI 305.1 Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
- G. ACI 306.1 Standard Specification for Cold Weather Concreting.
- H. ACI 308R Guide to External Curing of Concrete.
- I. ACI 309R Guide for Consolidation of Concrete.
- J. ACI 318 Building Code Requirements for Structural Concrete.
- K. ACI 347R Guide to Formwork for Concrete.
- L. ACI 555R Removal and Reuse of Hardened Concrete.
- M. ACI CP-1 Technician Workbook for ACI Certification of Concrete Field Testing Technician--Grade I.
- N. AISC 303 Code of Standard Practice for Steel Buildings and Bridges.
- O. ASTM A184/A184M Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
- P. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- Q. ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
- R. ASTM A955/A955M Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement.
- S. ASTM C1017/C1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- T. ASTM C1059/C1059M Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- U. ASTM C1064/C1064M Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
- V. ASTM C1077 Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- W. ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens).

- X. ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- Y. ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete.
- Z. ASTM C1315 Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- AA. ASTM C138/C138M Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
- BB. ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete.
- CC. ASTM C150/C150M Standard Specification for Portland Cement.
- DD. ASTM C1602/C1602M Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- EE. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete.
- FF. ASTM C172/C172M Standard Practice for Sampling Freshly Mixed Concrete.
- GG. ASTM C173/C173M Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- HH. ASTM C219 Standard Terminology Relating to Hydraulic Cement.
- II. ASTM C231/C231M Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- JJ. ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete.
- KK. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- LL. ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- MM. ASTM C33/C33M Standard Specification for Concrete Aggregates.
- NN. ASTM C330/C330M Standard Specification for Lightweight Aggregates for Structural Concrete.
- OO. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- PP. ASTM C42/C42M Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- QQ. ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete.
- RR. ASTM C567/C567M Standard Test Method for Determining Density of Structural Lightweight Concrete.
- SS. ASTM C595/C595M Standard Specification for Blended Hydraulic Cements.
- TT. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- UU. ASTM C881/C881M Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- VV. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete.
- WW. ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars.
- XX. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- YY. ASTM D1752 Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- ZZ. ASTM D2240 Standard Test Method for Rubber Property--Durometer Hardness.

- AAA. ASTM D3963/D3963M Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
- BBB. ASTM D7205/D7205M Standard Test Method forTensile Properties of Fiber Reinforced Polymer Matrix Composite Bars.
- CCC. ASTM E1155 Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
- DDD. ASTM E154/E154M Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- EEE. ASTM E1643 Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- FFF. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- GGG. ASTM E1993/E1993M Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- HHH. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- III. AWS D1.1/D1.1M Structural Welding Code Steel.
- JJJ. AWS D1.4/D1.4M Structural Welding Code Steel Reinforcing Bars.
- KKK. AWS D1.8/D1.8M Structural Welding Code-Seismic Supplement.
- LLL. COE CRD-C 513 Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops.
- MMM. COE CRD-C 572 Handbook for Concrete and Cement Corps of Engineers Specifications for Polyvinylchloride Waterstop.
- NNN. CRSI (DA4) Manual of Standard Practice.
- OOO. NSF 61 Drinking Water System Components Health Effects.
- PPP. ANSI/SDI C-2011 Standard for Composite Steel Floor Deck Slabs.
- QQQ. NRCMA Certification of Ready Mixed Concrete Production Facilities

1.03 DEFINITIONS

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

1.04 PRE-INSTALLATION CONFERENCE

- A. Pre-Installation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials.
 - 2. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Architect
 - b. Construction Manager.
 - c. Contractor's superintendent.
 - d. Independent testing agency.
 - e. Ready-mix concrete manufacturer.
 - f. Concrete subcontractor.
 - g. Special concrete finish subcontractor.
 - 3. Review the following:
 - a. Special Inspection and Testing and inspecting agency, procedures for field quality control.
 - b. Concrete finishes and finishing.

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Flad Architects

- c. Cold and hot weather concreting procedures.
- d. Curing procedures.
- e. Construction, contraction and isolation joints.
- f. Joint filler strips, and semi-rigid joint fillers.
- g. Forms and form removal limitations.
- h. Shoring and reshoring procedures.
- i. Vapor retarder installation.
- j. Anchor rod and anchorage device installation tolerances.
- k. Steel reinforcement installation.
- I. Floor and slab flatness and levelness measurement.
- m. Concrete repair procedures.
- n. Concrete protection.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Concrete Mix Designs: For each proposed concrete mixture, not less than 30 days before placing concrete.
 - 1. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Concrete Joint Layout: Indicate proposed construction joints required to construct the structure.
- E. Samples: For waterstops and vapor retarder, only with request for substitution.
- F. Qualification Data: For Installer, ready-mix manufacturer, and testing agency.
- G. Welders' Certificates.
- H. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforced polymer (FRP) reinforcing bars
 - 6. Fiber reinforcement.
 - 7. Waterstops.
 - 8. Curing compounds.
 - 9. Floor and slab treatments.
 - 10. Bonding agents.
 - 11. Adhesives.
 - 12. Vapor retarders.
 - 13. Semirigid joint filler.
 - 14. Joint filler strips.
 - 15. Repair materials.
- I. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate activity.
- J. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

- K. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- L. Field quality control reports.
- M. Minutes of pre-installation conference.
- N. Project record documents.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACIcertified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician -Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Certified in accordance with AWS D1.1/D1.1M, AWS D1.4/D1.4M, and AWS D1.8/D1.8M for the type of welds required on this Project, and renewed within the time period required by AWS code (certification maintenance).
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Steel, Stainless Steel, and FRP Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.08 COORDINATION

- A. Coordinate with other trades that require placement of embedded items in concrete. Obtain setting diagrams, sheet metal templates, instructions, and directions for installation of embedded items. Install embedded items or verify that they have been accurately positioned by the affected trades. Embedded items may include the following:
 - 1. Pipe sleeves.
 - 2. Anchor bolts.
 - 3. Wedge inserts.
 - 4. Deck support angles.
 - 5. Sockets for support of conduit and piping.

1.09 FIELD CONDITIONS

- A. Hot Weather Placement: Comply with ACI 305.1 and as follows:
 - 1. Maintain concrete temperature below 95 degF at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

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

PART 2 PRODUCTS

2.01 CONCRETE MIXTURE PERFORMANCE REQUIREMENTS

- A. Provide mix designs prepared by a ready-mix plant certified by the National Ready Mix Concrete Association and that will provide the concrete mixtures for this Project.
- B. Mix Design Data: Include, but not limited to, the following:
 - 1. Compressive Strength at 7 and 28 Days per ASTM C39/C39M; provide documentation of strength based on previous field experience or trial mixtures per ACI 301.
 - 2. Proportions: ACI 301 and ACI 318; proportioning by water-cementitious material ratio is not acceptable.
 - 3. Unit Weight of Concrete: ASTM C138/C138M.
 - 4. Air Content: Air content of freshly mixed concrete by the pressure method, ASTM C231/C231M, or the volumetric method, ASTM C173/C173M.
 - 5. Water/cementitious material ratio.
 - 6. Slump: ASTM C143/C143M.
 - 7. Aggregate: Gradation and quality of each type, including source, unit weight, and sieve analysis. Combined gradation of total aggregates.
 - 8. Type and percentage of fly ash or other cementitious materials.
 - 9. Water Soluble Chloride Ion Content: ACI 318.
 - 10. Admixtures: Type of admixture and manufacturer's name.
 - 11. Building element for which each design mixture will be used.
 - 12. Mixing Water: Indicate amounts of mixing water to be withheld for addition at Project site.

2.02 CONCRETE FORMWORK PERFORMANCE REQUIREMENTS

- A. Design and engineer formwork in accordance with ACI 347R to conform to configurations and dimensions of concrete members shown on Drawings and tolerance and finish requirements indicated.
- B. Include the following criteria in the design of concrete formwork:
 - 1. Rate and method of concrete placement.
 - 2. Construction loads, including vertical and horizontal impact loads.
 - 3. Design formwork to prevent leakage of concrete.
 - 4. Provide formwork of sufficient strength to safely hold the concrete until cured.
 - 5. Design formwork to be easily removed without impact, shock, or damage to concrete surfaces or adjacent materials.
 - 6. Maximum Deflection of Formwork: Not to exceed 1/240 of the span between members supporting the formwork; 1/2 inch maximum.
 - 7. Strength gain of concrete at time of proposed shoring removal.
 - 8. Concrete finish(es).

2.03 FORM-FACING MATERIALS

- A. Formed Finished Concrete: Form facing materials shall comply with ACI 301.
- B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 inch by 3/4 inch, minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form release agent with rust inhibitor for steel form facing materials.

- F. Form Ties: Factory fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.04 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Stainless Steel Reinforcing Bars: ASTM A955/A955M, Grade 60, Type 304; or non-magnetic Type 316L, deformed.
- D. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.

2.05 FIBER REINFORCED POLYMER (FRP) REINFORCEMENT

A. Fiber Reinforced Polymer (FRP) Reinforcing Bars: ASTM D7205/D7205M, fabricated from continuous fibers embedded in a thermosetting matrix; Grade F70, ultimate strength 70 ksi, E5.7.

2.06 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete per CRSI (DA4) - Manual of Standard Practice, of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless steel bar supports.
 - 2. For epoxy coated reinforcement, use epoxy coated or other dielectric-polymer-coated wire bar supports.
 - 3. For reinforcement within 1-1/2 inches of weathering surface of concrete, use stainess steel, galvanized, plastic, or plastic coated steel bar supports.
- B. Threaded Mechanical Bar Couplers: Pentair Engineered Electrical & Fastening Solutions; Lenton Standard A2: www.erico.com.

2.07 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, Type I, gray.
 - 2. Blended Portland limestone cement: ASTM C595/C595M, Type IL.
 - 3. Fly Ash: ASTM C618, Class C or F.
- B. Aggregates, General: Clean, hard, fine grained, naturally occurring washed gravel of quartz, limestone, dolomite, granite or feldspar, free from oil, organic matter, or other deleterious materials. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling. Maximum amount by weight of shale or cherty material shall not exceed 1 percent. Limit deleterious substances per ASTM C33/C33M.
- C. Normal-Weight Aggregates: Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
- D. Coarse Aggregate:
 - 1. ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 - 2. Minimum Specific Gravity: 2.45.

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- 3. Grading shall fall within limits of ASTM C33/C33M, Table 3, for selected aggregate maximum size.
- E. Nominal Maximum Coarse Aggregate Size:
 - 1. Footings: 1-1/2 inches.
 - Walls and piers: 1 inch.
 Slabs-On-Grade:
 - 1 inch.
- F. Fine Aggregate:
 - 1. Grading and Deleterious Substances: Within ASTM C33/C33M limits.
 - 2. Limit material finer than 200 sieve to 3 percent maximum.
- G. Recycled Concrete Coarse Aggregate: ACI 555R, and the following:
 - 1. Nominal Size: 1-1/2 inches.
 - 2. Use only for spread footings.
 - 3. Not to exceed 50 percent of the total coarse aggregate mix.
 - 4. Limit deleterious materials in recycled coarse aggregate to levels indicated in ACI 555R, Table 5.3.
 - 5. Recycled fine aggregate not permitted in concrete mixes.
- H. Combined Grading of Coarse and Fine Aggregates:
 - 1. Slabs-on-grade, slabs on metal deck, suspended slabs, building frame members, and building walls at lower level.
 - 2. Percentage retained for each sieve size below the nominal maximum size and above the No. 100 sieve.
 - 3. Nomianl Maximum Aggregate Sizes:
 - a. 1 inch and 3/4 inch: Minimum 8 percent and maximum
- I. Lightweight Aggregate: ASTM C330/C330M, 1 inch nominal maximum aggregate size.
- J. Water: ASTM C1602/C1602M and potable.

2.08 ADMIXTURES

- A. Admixtures: Certified by manufacturer to be compatible with other admixtures and do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Admixtures containing intentionally added chlorides are not permitted.
- B. Calcium Chloride: Not permitted.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures:
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Accelerating Admixture: ASTM C494/C494M, Type C.
 - 4. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 5. Water-Reducing and Accelerating Admixture: ASTM C494/C494M, Type E.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-setaccelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Cortec Corporation; MCI- 2000 / 2005NS: www.cortecvci.com.
 - 2. GCP Applied Technologies, Inc.; DCI-S: www.gcpat.com.
 - 3. Master Builders Solutions; MasterLife CI 222: www.master-builders-solutions.basf.us.
 - 4. Sika Corporation; FerroGard 901: www.us.sika.com.
- F. Integral Waterproofing Admixture: Integral, crystalline, capillary waterproofing admixture, certified per NSF 61.
 - 1. Performance:
 - a. Admixture shall not affect the setting time, strength, or durability properties of concrete.
 - 2. Products

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- a. Xypex Chemical Corporation; Xypex Admix C-500/C-500 NF: www.xypex.com
- b. Xypex Chemical Corporation; Xypex Admix C-1000/C-1000 NF: www.xypex.com
- c. Penetron Admix SB: www.penetron.com.
- d. Sika WT-240 P: www.sika.com.
- e. Sika Control WT-240 P Red: www.sika.com.
- f. Master Builders Solutions: MasterLife 300 Series: www.master-builderssolutions.com.

2.09 FIBER REINFORCEMENT

- A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M, Type III, 1 to 2-1/4 inches long.
 - 1. Products:
 - a. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF: www.euclidchemical.com.
 - b. FORTA Corporation; FORTA FERRO: www.forta-ferro.com.
 - c. GCP Applied Technologies; Strux 90/40: www.gcpat.com.
 - d. Master Builders Solutions; MasterFiber MAC Series: www.master-builderssolutions.basf.us.
 - e. Nycon, Inc.; XL: www. nycon.com.
 - f. Sika Corporation; Sika Fiber MS: www.usa.sika.com.
- B. Dosage for Composite Steel Deck Substrate: Minimum 4 lb. per cu. yd.
 - 1. Synthetic Macro-Fiber: Minimnum 4 lb per cu. yd., per ANSI/SDI C-2011

2.10 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
 - 1. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP: www.carlisleccw.com.
 - 2. CETCO; Volclay Waterstop-RX: www.cetco.com.
 - 3. Concrete Sealants Inc.; Conseal CS-231: www,conseal.com.
 - 4. Henry Company, Sealants Division; Hydro-Flex: www.us.henry.com.
 - 5. JP Specialties, Inc.; Earth Shield Type 20: www.jpspecialties.com.
 - 6. Sika Corp; Swellstop: www.usa.sika.com.

2.11 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Fortifiber Building Systems Group; Moistop Ultra 15: www.fortifiber.com.
 - 2. Grace Construction Products, W. R. Grace & Co.; Florprufe 120: www.grace.com.
 - 3. ISI Building Products; Viper VaporCheck II, 15 mil: www.insulationsolutions.com.
 - 4. Meadows, W. R., Inc.; Perminator 15 mil: www.wrmeadows.com.
 - 5. Raven Industries Inc.; Vapor Block 15: www.ravenind.com.
 - 6. Reef Industries, Inc.; Griffolyn Type-105: www.reefindustries.com.
 - 7. Stego Industries, LLC; Stego Wrap 15 mil Class A: www.stegoindustries.com.

2.12 LIQUID FLOOR TREATMENTS

- A. SC1: Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
 - 1. Basis of Design: Master Builders Solutions/BASF; MastrKure HD 300WB: www.masterbuilders-solutions.basf.us. Provide indicated product or comparable by the following:
 - 2. Curecrete Distribution Inc.; Ashford Formula: www.ashfordforumla.com.
 - 3. Dayton Superior Corporation; Day-Chem Sure Hard (J-17): www.daytonsuperior.com.
 - 4. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard: www.euclidchamical.com.
 - 5. Laticrete International; L&M Seal Hard: www.laticrete.com.

- 6. Metalcrete Industries; Floorsaver: www.metacreteindustries.com.
- 7. Symons by Dayton Superior; Buff Hard: www.daytonsuperior.com.
- 8. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear: www.vexcon.com.

2.13 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Master Builders Solutions; MasterKure ER 50: www.master-builders-solutions.us.basf.
 - 2. Dayton Superior Corporation; AquaFilm (J-74): www.daytonsuperior.com.
 - 3. Euclid Chemical Company (The), an RPM company; Eucobar: www.euclidchemical.com.
 - 4. Laticrete International; L&M E-CON: www.laticrete.com.
 - 5. Metalcrete Industries; Waterhold: www.metalcreteindustries.com.
 - 6. Sika Corporation; SikaFilm: www.usa.sika.com.
 - 7. Symons by Dayton Superior; Finishing Aid: www.daytonsuperior.com.
 - 8. Vexcon Chemicals, Inc.; Certi-Vex Envio Set: www.vexcon.com.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
 - 1. Dayton Superior Corporation; Clear Resin Cure (J-11-W).
 - 2. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C: www.euclidchemical.com.
 - 3. Laticrete International; L&M Cure R: www.laticrete.com.
 - 4. Meadows, W. R., Inc.; 1100-CLEAR: www.wrmeadows.com.
 - 5. Symons by Dayton Superior; Resi-Chem Clear: www.daytonsuperior.com.
 - 6. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100: www.vexcon.com.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Dayton Superior Corporation; Cure and Seal 309 (J-18): www.daytonsuperoir.com.
 - 2. Euclid Chemical Company (The), an RPM company; Aqua Cure VOX; Clearseal WB 150: www.euclidchemicals.com.
 - 3. Laticrete International; L&M Dress & Seal WB: www.laticrete.com.
 - 4. Master Builders Solutions; MasterKure CC 160WB: www.master-builderssolutions.us.basf.
 - 5. Meadows, W. R., Inc.; Vocomp-20: www.wrmeadows.com.
 - 6. Metalcrete Industries; Metcure: www.metalcreteindustries.com.
 - 7. Symons by Dayton Superior; Cure & Seal 18 Percent E: www.daytonsuperior.com.
 - 8. Vexcon Chemicals, Inc.; Starseal 309: www.vexcon.com.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
 - 1. Dayton Superior Corporation; Clear Resin Cure (J-11-W).
 - 2. Euclid Chemical Company (The), an RPM company; Diamond Clear VOX: www.euclidchemical.com.
 - 3. Laticrete International; L&M Dress & Seal WB: www.laticrete.com.
 - 4. Meadows, W. R., Inc.; Vocomp-20: www.wrmeadows.com.
 - 5. Metalcrete Industries; Metcure 0800: www.metalcreteindustries.com.
 - 6. Symons by Dayton Superior; Cure & Seal 18 Percent E: www.daytonsuperior.com.
 - 7. Vexcon Chemicals, Inc.; Starseal 0800: www.vexcon.com.
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

- 1. Products:
 - a. Dayton Superior Corporation; Cure and Seal 1315 EF: www.daytonsuperior.com.
 - b. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300: www.euclidchemical.com.
 - c. Laticrete International; L&M Lumiseal WB Plus: www.laticrete.com.
 - d. Meadows, W. R., Inc.; Vocomp-30: www.wrmeadows.com.
 - e. Metalcrete Industries; Metcure 30: www.metalcreteindustries.com.
 - f. Symons by Dayton Superior; Cure & Seal 31 Percent E: www.daytonsuperior.com.
 - g. Vexcon Chemicals, Inc.; Vexcon Starseal 1315: www.vexcon.com.

2.14 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D1751 asphalt-saturated cellulosic fiber or ASTM D1752 cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, aromatic polyurea with Type A shore durometer hardness range of 90 to 95 per ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing or Types IV and V, load bearing for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022 inch-thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.15 REPAIR MATERIALS

- A. Repair Underlayment: Cement based, polymer modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4000 psi at 28 days when tested per ASTM C109/C109M.
- B. Repair Overlayment: Cement based, polymer modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic _cement as defined in ASTM C219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested per ASTM C109/C109M.

2.16 CONCRETE MIXTURES, GENERAL

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

- Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures and associated testing. Cementitious Materials: Use fly ash, pozzolan, slag cement and silica fume/metakaolin as required to reduce the total amount of portland cement by not less than 15 percent.
- B. Limit water soluble, chloride ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - 4. Use corrosion inhibiting admixture in concrete mixtures where indicated.

2.17 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Normal-weight concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/CM Ratio: 0.48.
- B. Walls and Piers: Normal-weight concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/CM Ratio: 0.48.
 - 3. Air Content: 6 percent, plus or minus 1.5 percent at point of placement typical except as noted where exposed to exterior conditions.
- C. Exterior Exposed Walls, Site Walls, and Piers: Normal-weight concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/CM Ratio: 0.48.
 - 3. Air Content: 3 percent, plus or minus 1.5 percent at point of placement for 1 inch nominal maximum aggregate size.
- D. Slabs-on-Grade: Normal-weight concrete:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum W/CM Ratio: 0.50.
 - 3. Air Content: Do not allow air content of trowel finished floors to exceed 3 percent.
 - 4. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
- E. Exterior Slabs-on-Grade and Stoops: Normal-weight concrete:
 - 1. Minimum Compressive Strength: 4000 psi.
 - 2. Maximum W/CM Ratio: 0.50.
 - 3. Air Content: Do not allow air content of trowel finish floors to exceed 6 percent.

2.18 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI (DA4) - Manual of Standard Practice.

2.19 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete per ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.
 - 1. Maximum mix and delivery time 90 minutes

PART 3 EXECUTION

3.01 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, per ACI 301 and ACI 347R, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for where indicated.
 - 2. Class B, 1/4 inch for where indicated.
 - 3. Class C, 1/2 inch for for surfaces that will be permanently exposed to view where other finishes are not indicated.
 - 4. Class D, 1 inch for surfaces not exposed to view, unless otherwise indicated.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, per manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after the longer of cumulatively curing at not less than 50 degF for 24 hours or the concrete has reached 75 percent of 28-day design compressive strength, after placing concrete. Concrete has to be hard enough to not be damaged by form removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved 100 percent of its 28-day design compressive strength.

- 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.04 VAPOR RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder per ASTM E1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.05 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI (DA4), for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating per ASTM D3963/D3963M. Use epoxy coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 2. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders minimum distance of twice the beam width from a beam-girder intersection.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated in approved Shop Drawings. Construct contraction joints for a depth equal to at least one- fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond rimmed blades. Cut 1/8 inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full width, joint filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 9200 Joint Sealants, are indicated.
 - 3. Install joint filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars, sleeves, and support assemblies at joints where indicated.
- F. Contraction Joints in Walls: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane.
 - 1. At cast-in-place architectural concrete, refer to Architectural Drawings for required joint placement, or as approved by Architect.
 - 2. In addition to vertical contraction joints, install rustification joints to match profile of contraction joints, with rustification joint placement as shown on Architectural Drawings.

3.07 WATERSTOP INSTALLATION

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

3.08 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Before test sampling and placing concrete, water may be added at Project site in accordance with amounts listed in approved concrete design mixes.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment per ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to loose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is throughly worked around reinforcement or other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with straightedge and strike off to correct elevation.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb

slab surfaces before starting finishing operations.

3.09 FINISHING FORMED SURFACES

- A. As-Cast Formed Finishes Exposed to View: Comply with Surface Finish (SF) requirements in accordance with ACI 301 and the following, unless otherwise indicated:
 1. Walls : SF 3.0.
- B. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with minimum seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, and to be covered with a coating or covering material applied directly to concrete.
- D. Rubbed Finish: Apply the following to as-cast concrete where indicated:
 - Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and onehalf parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 a. Locations: As indicated on Drawings.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bullfloated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated, to receive concrete floor toppings, and to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated, to receive trowel finish, and to be covered with fluid-applied or sheet waterproofing, or membrane roofing.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated, exposed to view, to be covered with resilient flooring, carpet, ceramic tile set over a cleavage membrane, or another thin film finish coating system.
 - 2. Finish surfaces to the following tolerances, per ASTM E1155, for a randomly trafficked floor surface:
 - Tolerance Level I: Specified overall values of flatness, SOF(F) 20; and of levelness, SOF(L) 15; with minimum local values of flatness, MLF(F) 14; and of levelness, MLF(L) 12; noncritical, conventional locations.

- b. Tolerance Level II: Specified overall values of flatness, SOF(F) 25; and of levelness, SOF(L) 20; with minimum local values of flatness, MLF(F) 17; and of levelness, MLF(L) 15; carpeted areas and moderately flat locations.
- c. Tolerance Level III: Specified overall values of flatness, SOF(F) 35; and of levelness, SOF(L) 25; with minimum local values of flatness, MLF(F) 23; and of levelness, MLF(L) 17; for slabs-on-grade, thin floor coverings and flat locations.
- d. Tolerance Level IV: Specified overall values of flatness, SOF(F) 30; and of levelness, SOF(L) 20; with minimum local values of flatness, MLF(F) 24; and of levelness, MLF(L) 15; for suspended slabs, thin floor coverings.
- 3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10 ft- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply first trowel finish to surfaces indicated or where ceramic tile is to be installed by either thinset or thickset methods. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiberbristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip Resistive Finish: Before final floating, apply slip resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply per manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. of dampened slip resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip resistive aluminum granules.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with inplace construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 3 1/2 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 4000 psi at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor, as indicated.
 - 5. For supported equipment, install epoxy coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold weather protection and ACI 305.1 for hot weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of curing period by one or combination of the methods specified below.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces as follows:
 - 1. Floors to receive floor coverings: Use Methods 1, 2, or 3
 - 2. Floors and other concrete surfaces to receive penetrating Liquid Floor Treatment, sealers, or hardeners: Use Methods 1, 2, or 3.
 - 3. Floors and other concrete surfaces to receive additional concrete topping: Use Method 1 or 2.
 - 4. Floors to receive ground polished concrete finish: Use Method 1, 2, 3.
 - 5. Floors and other surfaces left exposed, where no additional finish is indicated: Use Method 4.
- E. Cure concrete according to ACI 308R, by one or a combination of the following methods:
 - 1. Method 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. Method 2; Moisture-Retaining Cover Curing: Cover concrete surfaces with moistureretaining 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. Method 3; Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering or applied floor treatment.
 - 4. Method 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.

3.13 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Do not apply to concrete that is less than three days old.

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- 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning, and cracks in excess of 0.012 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete and repair concrete in accordance with requirements of ACI 301. Limit cut depth to 1 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.012 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

- 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer per manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
- 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for minimum 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspection agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel reinforcement placement.
 - 2. Steel reinforcement welding.
 - 3. Headed bolts and studs.
 - 4. Verification of use of required design mixture.
 - 5. Concrete placement, including conveying and depositing.
 - 6. Curing procedures and maintenance of curing temperature.
 - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Location of Field Testing:
 - 1. When the point of delivery is the same as the point of placement (concrete is placed directly from the chute into the forms):
 - a. Conduct all testing at the point of delivery.
 - 2. When the point of delivery is different from the point of placement (concrete is transported from the truck to the forms by pump, conveyor, buggy, etc.):
 - a. Prepare compression test cylinders at point of delivery.
 - b. Perform concrete temperature measurements at point of delivery.
 - c. Perform slump tests at point of delivery.
 - d. Perform air content tests at point of placement.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 100 cu. yd. or fraction thereof, but not less than 5,000 sq. ft. of surface areas of slab or walls.
 - a. When frequency of testing will provide fewer than five compressive strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

- 2. Slump: ASTM C143/C143M; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
- 3. Air Content: ASTM C231/C231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- 4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is _____ 80 degF and above, and one test for each composite sample.
- 5. Unit Weight: ASTM C567/C567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- 6. Compression Test Specimens: ASTM C31/C31M.
 - a. Cast and laboratory cure four standard 6 inch by 12 inch, or five 4 inch by 8 inch of cylinder specimens for each composite sample. Specimens shall be used to evaluate whether specified strength acceptance criteria is satisfied.
 - b. Cast and field cure of cylinder specimens used to evaluate field curing and early-age, in-place concrete strength for early form stripping. Quantity and elements as requested by Contractor. Use minimum one set of two 6 inch by 12 inch, or one set of three 4 inch by 8 inch cylinders.
- 7. Compressive Strength Tests: ASTM C39/C39M.
 - a. Test one laboratory cured specimen at 7 days, and one set of two 6 inch by 12 inch, or one set of three 4 inch by 8 inch specimens at 28 days, and hold one in reserve for testing at Engineer's direction
 - b. Test one set of two 6 inch by 12 inch, or three 4 inch by 8 inch cylinder field cured specimens at number of days as requested by Contractor.
 - c. A compressive strength test shall be the average compressive strength from a set of two 6 inch by 12 inch, or three 4 inch by 8 inch cylinder specimens obtained from same composite sample and tested at age indicated.
 - d. Contractor shall reimburse the Owner for the cost of field cured cylinders.
- 8. When strength of field cured cylinders is less than 85 percent of companion laboratory cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive laboratory cured compressive strength tests equals or exceeds specified compressive strength and no compressive strength test value falls below specified compressive strength by more than 500 psi.
- 10. Test results shall be reported in writing to Architect, Construction Manager, and concrete manufacturer, within 48 hours of testing. Reports of compressive strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive strength, and type of failure for both 7- and 28-day tests.
- 11. Nondestructive Testing: Rebound hammer, ultrasonic, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air content, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
- 13. Additional testing and inspecting, at Construction Manager's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 14. Tested specimens which fail the acceptance criteria shall be held for inspection until approval to dispose by Architect.
- F. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

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- 1. Perform additional testing to determine compliance of corrected Work with specified requirements.
- G. Measure floor and slab flatness and levelness per ASTM E1155 within 24 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

SECTION 03 3543 POLISHED CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Polished concrete floor finishing.

1.02 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.
- B. National Floor Safety Institute (NFSI):
 - 1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.03 REFERENCE STANDARDS

- A. ACI 302.1R Guide to Concrete Floor and Slab Construction.
- B. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- C. ASTM C779/C779M Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- D. ASTM C805/C805M Standard Test Method fir rebound Number of Hardened Concrete.
- E. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- F. NFSI-101-A National Floor Safety Institute Standard for Evaluating High-Traction Flooring Materials, Coatings and Finishes.

1.04 PRE-INSTALLATION CONFERENCE

- A. Meet at the project site with the following parties in attendance.
 - 1. Owner.
 - 2. Architect.
 - 3. Construction Manager
 - 4. Construction Manager's Superintendent.
 - 5. Concrete Subcontractor's Superintendent.
 - 6. Polished concrete floor finishing contractor with Project foreman.
 - 7. Polished concrete floor systems manufacturer's representative.
- B. Establish guidelines and expectations for finished concrete work including floor flatness, levelness, and finish appearance of troweled floor slab.

1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Manufacturer's polishing system specifications.
 - 2. Manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
 - 3. Technical data sheet giving descriptive data, curing time, and application requirements.
- B. Shop Drawings: Indicate information on shop drawings as follows:
 - 1. Typical layout including dimensions and floor grinding schedule.
 - 2. Plan view of floor and joint pattern layout.
 - 3. Areas to receive colored surface treatment.
 - 4. Penetrating liquid densifier in notes.
- C. Qualification Data: For polished concrete floor contractor, including field supervisor and floor finish workers.
- D. Maintenance Data: For polished flooring to include in maintenance manuals. Include Product Data for floor care products used or recommended by Installer and names, addresses, and

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1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in, and with minimum five years of experience, manufacturing products of the type specified.
- B. Installer Qualifications: Company specializing in performing Work of this section, with minimum five years experience, holds accreditation from the Concrete Polishing Technical Institute, and approved by the manufacturer.
 - 1. The polished concrete floor finish manufacturer shall certify, in writing, that the installer designated for this project is:
 - a. Qualified for the scope of this project and has qualified personnel to perform the work
 - b. Current on the latest application means and methods of special concrete floor finish.
 - c. Eligible to receive manufacturer's special warranty.
- C. Source Limitations: Obtain each system product from single source from single manufacturer.

1.07 MOCKUPS

A. Mockups: Build mockups, on new and existing concrete floors, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.08 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with special concrete floor finish system manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting special concrete floor finish system application.
- B. Grinding Operations: Control and collect dust produced by grinding operations. Protect adjacent construction from detrimental effects of grinding operations
- C. Installation Location: Comply with manufacturer's written recommendations.

1.09 DELIVERY AND STORAGE

- A. Deliver materials in manufacturer's original packaging with identification labels and seals intact.
- B. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.10 COORDINATION

A. Coordinate work of this Section with Section03 3000 - Cast-in-Place Concrete.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
 - 1. Abrasion Resistance: ASTM C779/C779M, Method A, high resistance, no more than 0.008 inch wear in 30 minutes.
 - 2. Reflectivity: Increase of 35 percent as determined by standard gloss meter.
 - 3. Coefficient of Friction: All levels of finish exceed OSHA and ADA recommendations per ASTM D2047.
 - 4. High Traction Rating: NFSI 101-A, non-slip properties.
 - 5. Impact Strength: Up to 21 percent increase in impact strength per ASTM C805/C805M.
- B. Concrete Flooring Design Requirements:
 - 1. Hardened Concrete Properties:
 - a. Minimum Concrete Compressive Strength: 4000 psi.
 - b. Normal Weight Concrete Aggregates: No lightweight aggregate.
 - c. No air entrainment.
 - d. Minimum Cure Time: 45 days
 - 2. Placement Properties:
 - a. Natural concrete slump of 4-1/2 to 5 inches. Admixtures may be used.

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- 3. Flatness Requirements:
 - a. Overall FF 40.
 - b. Local FF 30.
- 4. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.
- 5. Concrete Curing:
 - a. Wet Curing: Seven day cure.

2.02 MANUFACTURERS

A. Basis-of-Design: Sika Scofield, or comparable products by the following:

2.03 MATERIALS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
 - 1. Basis-of-Design Product: Sika Scofield Company; Formula One Lithium Densifier MP: www.scofield.com.
- B. Sealing Coat: Chemical reactive, non-film forming, colorless treatment.
 - 1. Basis-of-Design Product: Sika Scofield Company; Formula One Finish Coat: www.lmscofield.com.

2.04 POLISHED CONCRETE FLOOR SYSTEM

- A. Patented process of diamond grinding and polishing in graduated grits from coarse to fine.
 1. Basis-of-Design System: Sika Scofield Company; Formula One Polished Concrete
 - System: www.lmscofield.com.
 - a. Grade: Grade 1 Light Sand Finish.
 - b. Class: Class II Medium Reflectivity, 800 grit.
 - c. Color: Sand.
 - d. Finish Level: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine exposed concrete floor surfaces for compliance with requirements for floor flatness and elevation tolerances.
- B. Verify concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.
 - 1. Verify concrete has cured for minimum 45 days.
 - 2. Slab-on-grade minimum compressive strength of 4000 psi.
 - 3. Verify concrete surfaces received a hard steel-trowel finish, minimum 3 passes, during placement.
- C. Notify Construction Manager and Architect in writing of conditions detrimental to polished concrete flooring system.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION

- A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.
- B. Examine surface to determine soundness of concrete for polishing.
- C. Remove surface contamination and repair or replace damage concrete surfaces.
- D. Saw cut joints in concrete slabs at all floor pattern color changes.
- E. Fill all floor joints with manufacturer's recommended joint filler.
- F. Confirm floor flatness rating and levelness rating.

- G. Protect concrete floor and adjacent construction from discoloration and spillage during application of color dyes, hardeners, and sealers.
- H. Prepare surfaces according to manufacturer's written instructions and as follows:
 - Clean concrete thoroughly by scraping, applying solvents or stripping agents, sweeping and pressure washing, or scrubbing with a rotary floor machine and detergents recommended by manufacturer. Rinse until water is clear and allow surface to dry.
 a. Do not use acidic solutions to clean surfaces.
 - 2. Test surfaces with droplets of water. If water beads and does not penetrate surface, or penetrates only in some areas, profile surfaces by grinding, sanding, or abrasive blasting. Retest and continue profiling surface until water droplets immediately darken and uniformly penetrate concrete surfaces.
 - 3. Apply acidic solution to dampened concrete surfaces, scrubbing with uncolored, acidresistant nylon-bristle brushes until bubbling stops and concrete surface has texture of 120-grit sandpaper. Do not allow solution to dry on concrete surfaces. Rinse until water is clear. Control, collect, and legally dispose of runoff.
 - 4. Neutralize concrete surfaces and rinse until water is clear. Test surface for residue with clean white cloth. Test surface per ASTM F710 to ensure pH is between 7 and 8.

3.03 INSTALLATION

- A. Apply floor finish prior to installation of fixtures and accessories.
- B. Install concrete floor system in accordance with the manufacturer's written instructions. Layout floors, joints, and patterns in accordance with approved shop drawings.
- C. Polished Concrete Floor Treatment: Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
 - 1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 - 2. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 - 3. Continue polishing with progressively finer grit diamond polishing pads to gloss level to match approved mockup.
 - 4. Control and dispose of waste products produced by grinding and polishing operations.
 - 5. Neutralize and clean polished floor surfaces.
- D. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.
- E. Remove defects and re-polish defective areas.
- F. Finish edges of floor finish adjoining other materials in a clean sharp manner.

3.04 INSPECTION

- A. Finished surfaces of polished concrete floors shall be free of all random scratch patterns.
- B. All edges shall be uniformly cut and processed when compared to remainder of floor.
- C. Correct defective areas in floor prior to application of final coat.

3.05 ADJUSTMENTS

- A. Polish surfaces to higher gloss where finish does not meet specified gloss levels per mockup.
- B. Fill joints flush to surface.

3.06 CLEANING

- A. Mechanically scrub treated floors for seven days with soft to medium pads with approved cleaning solution in manner and sequence recommended by floor polishing system manufacturer.
- B. Upon completion, remove surplus and excess materials, rubbish, tools and equipment.

C. Instruct Owner's maintenance personnel on proper maintenance procedures for polished concrete floors.

3.07 PROTECTION

- A. Protect polished concrete flooring from damage. When construction traffic is permitted, maintain flooring as clean as possible by removing surface stains and spillage of materials as they occur.
- B. Maintain polished concrete flooring free of stains, discoloration, dirt, and other foreign material. Sweep flooring not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

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SECTION 04 2200 CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete masonry units.
- B. Mortar and grout.
- C. Steel reinforcing bars.
- D. Masonry-joint reinforcement.

1.02 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.03 REFERENCE STANDARDS

- A. ACI SP-66 ACI Detailing Manual.
- B. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- C. ASTM A951/A951M Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- D. ASTM A996/A996M Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
- E. ASTM C1019 Standard Test Method for Sampling and Testing Grout for Masonry.
- F. ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens).
- G. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry.
- H. ASTM C114 Standard Test Methods for Chemical Analysis of Hydraulic Cement.
- I. ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms.
- J. ASTM C1329/C1329M Standard Specification for Mortar Cement.
- K. ASTM C140/C140M Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- L. ASTM C143/C143M Standard Test Method for Slump of Hydraulic-Cement Concrete.
- M. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
- N. ASTM C150/C150M Standard Specification for Portland Cement.
- O. ASTM C1506 Standard Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters.
- P. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes.
- Q. ASTM C270 Standard Specification for Mortar for Unit Masonry.
- R. ASTM C404 Standard Specification for Aggregates for Masonry Grout.
- S. ASTM C476 Standard Specification for Grout for Masonry.
- T. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- U. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units.
- V. ASTM C91/C91M Standard Specification for Masonry Cement.
- W. TMS 402/602 Building Code Requirements and Specification for Masonry Structures.
- X. NCMA TEK 8-4A Cleaning Concrete Masony.

1.04 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Meeting: Convene meeting at Project site, minimum two weeks prior to start of masonry work, with the following parties in attendance.
 - 1. Owner.
 - 2. Architect.
 - 3. Construction Manager.
 - 4. Masonry Contractor, including Project Foreman.
 - 5. Masonry Inspector.
 - 6. Testing Laboratory.
 - 7. Other interested parties.
- B. Review methods and procedures related to masonry construction including, but not limited to, the following:
 - 1. Review submittals, including
 - a. CMU.
 - b. Reinforcing steel shop drawings.
 - c. Masonry accessories.
 - d. Mortar type, proportions, and mix designs.
 - e. Grout type, proportions, and mix designs.
 - 2. Review
 - a. Masonry inspection procedures.
 - b. Grout and grouting procedures.
 - c. Mortar and grout testing procedures.
 - d. Vertical and horizontal steel reinforcing shop drawings, splice lengths, and bar positioners.
 - e. Hot/cold weather procedures.
 - f. Approved Masonry Material Cleaning Plan.
 - g. Coordination issues with other trades.
 - h. Protection of and scheduling of non-masonry construction that will interfere with masonry work.
 - i. Job-Site storage and staging areas.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
- C. Construction Manager shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
 - 1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

1.05 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI SP-66. Show elevations of reinforced walls.
- C. Qualification Data: For testing agency.
- D. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units determined per TMS 402/602.

- 2. Cementitious materials. Include name of manufacturer, brand name, and type.
- 3. Mortar admixtures.
- 4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
- 5. Grout mixes. Include description of type and proportions of ingredients.
- 6. Reinforcing bars.
- 7. Joint reinforcement.
- 8. Anchors, ties, and metal accessories.
- E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test per ASTM C109/C109M for compressive strength, ASTM C1506 for water retention.
 - 2. Include test reports, per ASTM C1019, for grout mixes required to comply with compressive strength requirement.
 - 3. Test Reports shall have been performed within 18 months of Contract date. Test Reports more than 18 months old are not acceptable.
- F. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements specified in referenced unit masonry standard.
- G. Masonry Material Cleaning Plan: Include products and techniques for each masonry product and each assembly being constructed for this Project. Prior to submission, Cleaning Plan shall be signed and approved by:
 - 1. Contractor.
 - 2. Mason Contractor
 - 3. All masonry unit manufacturers.
 - 4. Cleaning materials supplier and manufacturer.
 - 5. Cleaning Subcontractor.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C1093 for testing indicated.
- B. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
 - 1. Maintain one copy of each document on project site.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.08 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover minimum 24 inches down both sides of walls, and hold cover securely in place.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

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PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) per TMS 402/602.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms per ASTM C1314.

2.03 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 402/602 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and within 20 feet vertically and horizontally of a walking surface.

2.04 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depth of 8 inches, 10 inches or 12 inches.
 - 2. Special Shapes: Provide non-standard blocks configured for corners and other detailed conditions.
 - a. Provide square-edged units for outside corners.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and textureunless otherwise indicated.

2.05 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for coldweather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.6 percent when tested per ASTM C114.
- B. Masonry Cement: ASTM C91/C91M, Type M or S.
- C. Mortar Cement: ASTM C1329/C1329M, Type M or S.
- D. Hydrated Lime: ASTM C207, Type S.
- E. Mortar Aggregate: ASTM C144.
- F. Grout Aggregate: ASTM C404.
- G. Water: Clean and potable.

2.06 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148 inch steel

wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.
 - 1. Exterior Walls: Hot-dip galvanized carbon steel.
 - 2. Wire Size for Side Rods: 0.148 inch diameter.
 - 3. Wire Size for Cross Rods: 0.148 inch diameter.
 - 4. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.07 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland-cement lime or masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland-cement lime or masonry cement mortar.
 - 4. For reinforced masonry, use portland-cement lime or masonry cement mortar.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: ASTM C270, Proportion Specification.
 - 1. Exterior, non-loadbearing masonry: Type M or S.
- D. Grout: ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout per ASTM C476, Table 1 or paragraph 4.2.2 for specified 28 day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 10 inches as measured according to ASTM C143/C143M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
 - 5. Verify that related items provided under other sections are properly sized and located.
 - 6. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

3.03 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.04 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4 inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

3.05 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 3. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

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- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not furrow bed joints or slush head joints.
- C. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.06 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement minimum 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.07 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.08 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Mason Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 - 1. Begin masonry construction only after inspectors have verified proportions of siteprepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C140/C140M for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, per ASTM C780.

- G. Mortar Test (Property Specification): For each mix provided, per ASTM C780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, per to ASTM C1019.
- I. Prism Test: For each type of construction provided, per ASTM C1314 at 7 days and at 28 days.

3.09 REPAIRING, POINTING AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.10 SEALER

A. Apply sealer in conformance with manufacturer's recommendations.

3.11 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soilcontaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 2000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 0519 POST-INSTALLED ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The use of anchors for structural applications documented on the Structural Drawings, including:
 - 1. Post-installed anchors into concrete.
 - 2. Post-installed anchors into structural concrete masonry.
 - 3. Post-installed reinforcing bars into concrete.

1.02 SECTION DOES NOT INCLUDE

- A. Anchors, embeds, and other materials placed prior to concrete pour and cast into concrete, refer to Section 03 3000.
- B. Post-installed anchors used for non-structural applications, including the following:
 - 1. Guard rails.
 - 2. Mechanical, electrical, and plumbing equipment support and bracing.
 - 3. Support and bracing for suspended mechanical, electrical, and plumbing systems.
 - 4. Cladding and facade connections.
 - 5. Process equipment anchorage.
 - 6. Anchorage for conveyance systems such as elevators, escalators, material lifts, and material conveyors.
 - 7. Anchors associated with all systems designed by others as delegated design, including, but not limited to, equipment platforms, modular enclosures, manufactured mezzanines, canopies, metal stair systems, medical equipment supports, and cold formed metal framing.
 - 8. Any anchorage not included in the construction drawings that is required due to Contractor means and methods or field conditions.

1.03 REFERENCE STANDARDS

- A. ACI 355.2 Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
- B. ACI 355.4 Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary.
- C. ASTM A108 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- D. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A193/A193M Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
- F. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- G. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
- H. ASTM A449 Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
- I. ASTM A510/A510M Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
- J. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
- K. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- L. ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
- M. ASTM A995/A995M Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts.

- N. ASTM B348 Standard Specification for Titanium and Titanium Alloy Bars and Billets.
- O. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- P. ASTM E488/E488M Standard Test Methods for Strength of Anchors in Concrete Elements.
- Q. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- R. ASTM F436 Standard Specification for Hardened Steel Washers.
- S. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- T. ASTM F594 Standard Specification for Stainless Steel Nuts.
- U. ICC-ES AC01 Acceptance Criteria for Expansion Anchors in Masonry Elements.
- V. ICC-ES AC308 Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- W. ICC-ES AC58 Acceptance Criteria for Adhesive Anchors in Masonry Elements.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Unit dimensions.
 - 2. Unit materials and coatings.
 - 3. Installation instructions.
- B. Engineering Design Data: Data substantiating specified design requirements, including, but not limited to, the following:
 - 1. Anchor design strength in shear, tension, and combined loading.
 - 2. Spacing and edge criteria.
 - 3. All required design parameters.
- C. Qualification Data: For qualified Installer.
- D. Evaluation Reports: For anchors, from ICC-ES.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall have minimum five years experience performing similar installations.
 - 2. Installer Training: Installer shall attend comprehensive training with the manufacturer or the manufacturer's representative. Training shall consist of a review of the complete installation process for post-installed anchors, including, but not limited to the following:
 - a. Hole drilling procedure.
 - b. Hole preparation and cleaning technique.
 - c. Adhesive injection technique and dispenser training/maintenance.
 - d. Rebar dowel preparation and installation.
 - e. Proof loading/torquing.
 - 3. Installer shall be certified in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program for installation of adhesive anchors installed horizontally or upwardly inclined to support tension loads
- B. Manufacturer Qualifications: An entity with minimum 10 years experience in the manufacture of anchor systems specified in this Section.
- C. Certifications: Unless otherwise indicated, anchors shall have the following certification:
 1. ICC ES Evaluation Report indicating conformance with current applicable ICC ES
 - Acceptance Criteria and current to applicable building code in effect.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store anchors in accordance with manufacturer's recommendations.
- B. Anchoring adhesives shall be stored at temperatures prescribed by the manufacturer and shall not be used beyond expiration date.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install adhesive anchors when ambient or substrate temperatures are outside limits permitted by anchor manufacturer or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Existing Conditions at Anchor Base Material:
 - 1. Anchors are designed to be installed without interference from existing reinforcing in anchor base material. Field locate reinforcing prior to anchor installation and advise Engineer of Record of interference requiring modification.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Manufacturer: Provide products by the following:
 1. Hilti Inc.

2.02 MATERIALS

- A. Bolts and Studs: ASTM A307; ASTM A449 where "high strength" is indicated.
- B. Carbon and Alloy Steel Nuts: ASTM A563.
- C. Carbon Steel Washers: ASTM F436.
- D. Carbon Steel Threaded Rod: ASTM A36/A36M, ASTM A307, ASTM F1554, or ASTM B348; or ASTM A193/A193M Grade B7; or ISO 898 Class 5.8.
- E. Wedge Anchors: ASTM A510/A510M; or ASTM A108.
- F. Reinforcing Bars: ASTM A615/A615M Grade 60, ASTM A706/A706M, or ASTM A995/A995M
- G. Stainless Steel Anchors: AISI Type 304.
- H. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
- I. Stainless Steel Nuts: ASTM F594.
- J. Zinc Plating: ASTM B633.
- K. Hot-Dip Galvanizing: ASTM A153/A153M.
- L. Reinforcing Dowels: ASTM A615/A615M.

2.03 ADHESIVE ANCHORS

- A. Adhesive anchor system shall conform to ACI 355.4 for anchors into concrete elements, and ICC-ES AC58 for anchors into masonry elements.
 - 1. Interior Use: Unless indicated otherwise on Drawings, provide carbon steel threaded rods with zinc plating.
 - 2. Exterior use: Unless otherwise indicated on Drawings, provide stainless steel anchors with stainless steel nuts and washers of matching alloy group and minimum proof stress equal or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
- B. Adhesive Anchors for Anchoring into Concrete:
 - 1. Basis-of-Design Product: Hilti, Inc.; HIT-HY 200-V3: www.us.hilti.com.
- C. Adhesive Anchors for Anchoring into Grout-filled Concrete Masonry:
 1. Basis-of-Design Product: Hilti, Inc.; HIT-HY270: www.us.hilti.com..
- D. Adhesive Anchors for Anchoring into Hollow Concrete Masonry:
 - 1. Basis-of-Design Product: Hilti, Inc.; HIT-HY270: www.us.hilti.com.

2.04 MECHANICAL ANCHORS

- A. Mechanical anchor system shall conform to ACI 355.2 for anchors into concrete elements, and ICC-ES AC01 for anchors into masonry elements.
 - 1. Interior Use: Unless indicated otherwise on Drawings, provide carbon anchors with zinc plating.

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- 2. Exterior use: Unless otherwise indicated on Drawings, provide stainless steel anchors with stainless steel nuts and washers of matching alloy group and minimum proof stress equal or greater than the specified minimum full-size tensile strength of the externally threaded fastener. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
- B. Mechanical Anchors for Anchoring into Concrete:
 - 1. Basis-of-Design Product: Hilti, Inc.; Kwik Bolt-TZ2: www.us.hilti.com.
- C. Mechanical Anchors for Anchoring into grout filled Concrete Masonry:
 1. Basis-of-Design Product: Hilti, Inc.; Kwik Bolt-TZ2: www.us.hilti.com.

2.05 POST-INSTALLED REINFORCING BARS

- A. Post-installed reinforcing bar system shall conform to IICC-ES AC308 for reinforcing bars into concrete elements.
- B. Post-Installed Reinforcing Bars into Concrete
 - 1. Basis of Design Product: Hilti; HIT-RE 500-V3 or HIT-HY 200-V3: www.us.hilti.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for anchor installation and other conditions affecting performance of the Work.
- B. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Install anchors in accordance with manufacturer's written instructions.
- B. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used, unless otherwise permitted specifically in writing by Architect.
- C. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in drilling to avoid damaging existing reinforcing or embedded items. Notify Architect if reinforcing steel or other embedded items are encountered during drilling.
- D. Where holes are drilled in concrete or masonry, drill holes accurately and squarely, and clean holes in accordance with manufacturer's recommendations.
- E. Anchor applied items neatly, with items mounted plumb and level unless otherwise indicated.
- F. Protect threads from damage during installation.
- G. Do not install anchors in concrete that is less than 21 days old.

3.03 INSTALLING ADHESIVE ANCHORS AND POST-INSTALLED REINFORCING BARS

- A. Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive.
- B. Follow manufacturer's recommendations to ensure proper mixing of adhesive components.
- C. Inject adhesive into holes proceeding from bottom of hole and progressing toward the surface in such manner as to avoid introduction of air pockets in the adhesive. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface.
- D. Immediately following adhesive injection, shim anchors/reinforcing bars with suitable device to center the anchor/reinforcing bars in the hole. Do not disturb or load anchors/reinforcing bars before the manufacturer specified cure time has elapsed.

3.04 INSTALLING MECHANICAL ANCHORS

A. Perform mechanical anchor installation in accordance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections indicated on Drawings.
- B. Manufacturer's Field Representation: Arrange for anchor manufacturer's representative to visit site and demonstrate proper installation procedures for post-installed anchors and to observe Contractor's installation procedures, at no extra cost to Owner.
 - 1. This requirement applies to the following post-installed anchors;
 - a. Adhesive anchors.
 - b. Mechanical anchors.
 - c. Post installed reinforcing bars.
 - 2. Architect reserves the right to require additional observation of Contractor's installation procedures by manufacturer's representative at no extra cost to the Owner

3.06 ADJUSTING AND CLEANING

A. Defective Work: Remove and replace misplaced or defective anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout.

END OF SECTION

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SECTION 05 1200 STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel.
- B. Grout.

1.02 REFERENCE STANDARDS

- A. AISC 303 Code of Standard Practice for Steel Buildings and Bridges.
- B. AISC 341 Seismic Provisions for Structural Steel Buildings.
- C. AISC 360 Specification for Structural Steel Buildings.
- D. AISC 420-10/SSPC-QP 3 Certification Standard for Shop Application of Complex Protective Coating Systems.
- E. ASTM A108 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- F. ASTM A1085/A1085M Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS).
- G. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- H. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- I. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
- J. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- K. ASTM A529/A529M Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
- L. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- M. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
- N. ASTM A572/A572M Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- O. ASTM A588/A588M Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi (345 MPa) Minimum Yield Point, with Atmospheric Corrosion Resistance.
- P. ASTM A6/A6M Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
- Q. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- R. ASTM A992/A992M Standard Specification for Structural Steel Shapes.
- S. ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- T. ASTM E164 Standard Practice for Contact Ultrasonic Testing of Weldments.
- U. ASTM E165/E165M Standard Practice for Liquid Penetrant Testing for General Industry.
- V. ASTM E709 Standard Guide for Magnetic Particle Testing.
- W. ASTM E94 Standard Guide for Radiographic Examination.
- X. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

- Y. ASTM F3125/F3125M Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- Z. ASTM F436 Standard Specification for Hardened Steel Washers.
- AA. ASTM F959 Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
- BB. AWS D1.1/D1.1M Structural Welding Code Steel.
- CC. AWS D1.2/D1.2M Structural Welding Code Aluminum.
- DD. AWS D1.4/D1.4M Structural Welding Code Steel Reinforcing Bars.
- EE. AWS D1.8/D1.8M Structural Welding Code-Seismic Supplement.
- FF. RCSC (HSBOLT) Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.
- GG. SSPC-PA 1 Shop, Field, and Maintenance Coating of Metals.
- HH. SSPC-SP 2 Hand Tool Cleaning.
- II. SSPC-SP 3 Power Tool Cleaning.
- JJ. SSPC-SP 6 Commercial Blast Cleaning.

1.03 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303.
- B. Seismic-Force-Resisting System: Elements of structural-steel frame designated as "SFRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A6/A6M with flanges thicker than 1-1/2 inches.
 - 2. Welded built-up members with plates thicker than 2 inches.
 - 3. Column base plates thicker than 2 inches.
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. The area of a member or a connection where discontinuities and attachments are prohibited or limited.
- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Force-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.
- F. Quality Assurance: Monitoring and inspection tasks perfromed by an agency or firm other than the fabricator or erector to ensure that the material provided and work performed by fabricator and erector meet the requiements of the approved Construction Documents and referenced standards. Quality assurance includes those tasks designated "special inspection" by the applicable building code and is applicable to both work performed at the source and work performed in the field.
- G. Source Quality Control: Controls and inspections implemented by the fabricator or erector, as applicable, to ensure that the material provided and work performed meet the requirements of the approved Construction Documents and referenced standards.

1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PRE-INSTALLATION MEETINGS

- A. Pre-Installation Conference: Conduct conference at Project site minimum two weeks prior to delivery, installation, AESS and associated work.
 - 1. Meet with the following parties in attendance:
 - a. Owner.
 - b. Architect.
 - c. Contractor and his superintendent.
 - d. Steel Fabricator.
 - e. AESS Erector.
 - f. Major subcontractors
 - g. Other parties concerned with performance of AESS.
- B. All participants at conference shall be familiar with Product and authorized to conclude matters relating to the work. Review methods and procedures related to, AESS including the following:
 - 1. Coordinate requirements for shipping, special handling, attachment of safety cables and temporary erection bracing, touch-up painting, and other requirements for AESS.
 - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review erection procedures.
 - 4. Review site welding procedures, finish painting and touch-up painting.
 - 5. Review approved AESS mock-up in relation to fabrication and erection techniques.
 - 6. Proceeed with AESS installation only where everyone concerned agrees that required conditions can be maintained.
- C. Contractor shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
 - 1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

1.06 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 5. Indicate material properties, surface preparation, galvanized items, shop primed items, and extent of AESS
 - 6. Identify members and connections of the Seismic-Force-Resisting System.
 - 7. Indicate locations and dimensions of protected zones.
 - 8. Identify demand critical welds.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide per AWS D1.1/D1.1M, and AWS D1.8 when demand critical welds are present for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Qualification Data: For Installer, fabricator, shop painting applicators, professional engineer, and testing agency.
- E. Welders' Certificates.
- F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

- G. Mill test reports for structural steel, including chemical and physical properties.
- H. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- I. Survey of existing conditions.
- J. Source quality-assurance reports.
- K. Field quality-control reports.

1.07 SOURCE QUALITY CONTROL

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU (Certified Building Fabricator), or is accredited by IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Shop-Painting Applicators: Qualified according to AISC 420-10/SSPC-QP 3.
- D. Welding Qualifications: Certify in accordance with AWS D1.1/D1.1M, AWS D1.4/D1.4M, and AWS D1.8/D1.8M for the type of welds required on this Project, and renewed within the time period required required by AWS code (certification maintenance).
 - Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341.
 - 3. AISC 360.
 - 4. RCSC (HSBOLT).

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.01 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A992/A992M.

- 1. Supply Charpy V-notch impact testing for members of the Seismic Force Resisting System with flanges 1-1/2 inches thick or thicker. Testing shall show a Charpy V-notch toughness of 20-ft-lb at 70 degrees F when tested in the alternate core location as described in ASTM A6 Supplementary Requirement S30.
- C. Channels, Angles, S-Shapes and M-Shapes: ASTM A36/A36M.
- D. Plate and Bar: Furnish Grade 50 material, unless otherwise designated.
 - 1. Grade 50: ASTM A572/A572M, Grade 50; ASTM A588/A588M, Grade 50; or ASTM A529/A529M, Grade 50 or Grade 55.
 - a. Grade 50 material shall be acceptable for all uses, except bolted shear tabs at beamto-column connections.
 - 2. Grade 36: ASTM A36/A36M.
 - a. Provide Grade 36 material for bolted shear tabs at beam-to-column connections and where designated on drawings.
 - 3. Grade 42: ASTM A572/A572M, Grade 42, or ASTM A588/A588M for baseplates thicker than 4 inches.
 - 4. Supply Charpy V-Notch impact testing, in accordance with ASTM A6/A6M, Supplementary Requirement S5, for plates 2 inches thick or thicker used in the Seismic Force Resisting System. Steel shall have a minimum average value of 20 ft-lbs at +70 deg F when tested in accordance with ASTM A673, Frequency P. Requirement applies to the following:
 - a. Plates for built-up members used in the SFRS.
 - b. Baseplates for SFRS columns.
 - c. SFRS connection plates, including continuity plates and gusset plates.
- E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M Grade C or ASTM A1085/A1085M, structural tubing.
- F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - 1. Weight Class: As indicated.
- G. Welding Electrodes: Comply with AWS requirements.

2.02 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, heavy-hex steel structural bolts or tension control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade C, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959, Type 490, compressible-washer type with plain finish.
- C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, heavyhex steel structural bolts; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating or Mechanically deposited zinc coating.
 - 2. Direct-Tension Indicators: ASTM F959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Unheaded Anchor Rods: ASTM F1554 Grade 36
 - 1. Configuration: Straight.

- 2. Nuts: ASTM A563 heavy-hex carbon steel.
- 3. Plate Washers: ASTM A36/A36M carbon steel.
- 4. Washers: ASTM F436, Type 1, hardened carbon steel.
- 5. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M Class C.
- F. Threaded Rods: ASTM A36/A36M.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Washers: ASTM F436 Type 1, hardened carbon steel.
 - 3. Finish:Plain or Hot-dip zinc coating, ASTM A153/A153M Class C.
- G. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
 - 1. Manufacturers:
 - a. Amscot Structural Products Corp.: www.amscotnj.com.
 - b. Fluorcarbon Company Limited: www.fluorocarbon.co.uk.
 - c. R.J. Watson Bridge & Structural Engineered Systems: www.rjwatson.com.
 - d. Seismic Energy Products, L.P.: www.sepbearings.com.
 - 2. Mating Surfaces: PTFE and PTFE.
 - 3. Coefficient of Friction: Not more than 0.03.
 - 4. Design Load: Not less than 2,000 psi.
 - 5. Total Movement Capability: 2 inches.

2.03 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.04 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 - 1. Provide grout with minimum 28-day compressive strength of not less than twice (2X) the 28-day compressive strength of the concrete elements directly supporting column grout.
 - 2. Concrete strengths are as indicated in the Structural General Notes and Specifications.

2.05 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate per AISC 303 and AISC 360. Conform to additional requirements of AISC 341 for members and connections of the Seismic Force Resisting System.
 - 1. Camber structural-steel members where indicated.
 - 2. Identify high-strength structural steel per ASTM A6/A6M and maintain markings until structural steel has been erected.
 - 3. Mark and match-mark materials for field assembly.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 1. Plane thermally cut edges to be welded to comply with AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted per SSPC-SP 2, Hand Tool Cleaning. Clean and prepare steel surfaces that are to receive shop primer per heading "Shop Priming".
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

2.06 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts per RCSC (HSBOLT) for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, except where otherwise designated on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and ISO 21930 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
 - 2. For members and connections of the SFRS, conform to supplemental requirements of AWS D1.8/D1.8M and the following:
 - a. Use filler materials specified for SFRS welds.
 - b. Weld access holes for complete penetration beam flange to column connections shall be shaped in accordance with AWS D1.8/D1.8M, Paragraph 6.9.1.2, "Alternate Geometry"; and conform to quality requirements of Paragraph 6.9.2.
 - 3. Demand Critical Welds: Conform to requirements for welding of members and connections of SFRS, the supplemental requirements of AWS D1.8/D1.8M applicable to Demand Critical Welds, and the following:
 - a. Use filler materials specified for Demand Critical welds.
 - b. Complete penetration welds made through access holes in member webs or gusset plates shall follow the welding sequence of AWS D1.8/D1.8M , Paragraph 6.14.
 - c. Remove backing bars where designated on drawings.
 - d. Provide a reinforcing fillet at locations where backing bars are removed.
 - e. Butt joints of parts of unequal thickness or width, shall have a smooth transition between offset surfaces in accordance with provisions of AWS D1.1/D1.1M for tension joints.

2.07 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean all surfaces. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 3, Power Tool Cleaning.
 - a. Minimum requirement for galvanized, primed, or primed and painted steel unless higher level finish indicated.
 - 2. SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
 - a. Minimum requirement for high perfomance coatings or AESS.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.08 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel per ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in finished Work, unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.09 SOURCE QUALITY ASSURANCE

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections per RCSC (HSBOLT) and AISC 341 for SFRS shop-bolted connections.
- C. Welded Connections:
 - 1. Visually inspect shop-welded connections according to AWS D1.1/D1.1M andAWS D1.8/D1.8M when AISC 341, Seismic Provisions, apply. In addition to visual inspection, test and inspect shop welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.
 - Ultrasonic test 100 percent of complete joint penetration welds in materials 5/16-inch or greater. Perform testing in accordance with procedures and acceptance criterial of AWS D1.8/D1.8M.
 - a. Apply requirements for seismic connections to all connections.
 - b. Subject to approval of authority having jurisdiction, the amount of testing will be permitted to be reduced in accordance with provisions of AISC 341.
 - For members and connections of the SFRS, perform additional nondestructive testing (NDT) of welds and base metal adjacent to welds in accordance with provisions AISC 341. Perform tests in accordance with applicable requirements of AWS D1.8/D1.8M.
 - a. MT inspection of k-area base metal in web, where welding of continuity plates, doubler plates or stiffener plates occur in k area.
 - b. MT inspection of beam-to-column CJP's.
 - c. UT testing of base metal, including baseplates, thicker than 1-1/2 inches for laminations where connected material is greater than 3/4 inches.
 - d. MT testing of beam copes and access holes at welded connections where flanges are thicker than 1-1/2 inches.
- D. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in

intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.03 ERECTION

- A. Set structural steel within erection tolerances as defined in AISC 303 and AISC 360
 - 1. Conform to additional requirements of AISC 341 for members and connections of the Seismic Force Resisting System.
- B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage resisting grouts.
- C. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection unless approved by Architect. Thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts per RCSC (HSBOLT) for type of bolt and type of joint specified.
 - 1. Joint Type: Snug-tightened, except where otherwise designated on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.
 - 4. For members and connections of the SFRS , conform to supplemental requirements of AWS D1.8/D1.8M and the following:
 - a. Use filler materials specified for SFRS welds.
 - b. Weld access holes for complete penetration beam flange to column connections shall be shaped in accordance with AWS D1.8/D1.8M, Paragraph 6.9.1.2, "Alternate Geometry"; and conform to quality requirements of Paragraph 6.9.2.
 - 5. Demand Critical Welds: Conform to requirements for welding of members and connections of SFRS, the supplemental requirements of AWS D1.8/D1.8M applicable to Demand Critical Welds, and the following:
 - a. Use filler materials specified for Demand Critical welds.
 - b. Complete penetration welds made through access holes in member webs or gusset plates shall follow the welding sequence of AWS D1.8/D1.8M, Paragraph 6.14.

- c. Remove backing bars where designated on drawings.
- d. Provide a reinforcing fillet at locations where backing bars are removed.
- e. Butt joints of parts of unequal thickness or width, shall have a smooth transition between offset surfaces in accordance with provisions of AWS D1.1/D1.1M for tension joints.

3.05 FIELD QUALITY ASSURANCE

- A. Special Inspections: Owner will engage a qualified special inspector to perform testing and inspection indicated in the Schedule of Special Inspections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections per RCSC (HSBOLT).
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M and AWS D1.8/D1.8M when AISC 341, Seismic Provisions, apply.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94.
 - Ultrasonic test 100 percent of complete joint penetration welds in materials 5/16 inch or greater. Perform testing in accordance with procedures and acceptance criterial of AWS D1.8/D1.8M
 - a. Apply requirements of seismic connections to all connections.
 - b. Subject to approval of authority having jurisdiction, the amount of testing will be permitted to be reduced in accordance with provisions of AISC 341.
 - 3. For members and connections of the SFRS, perform additional nondestructive testing (NDT) of welds and base metal adjacent to welds in accordance with provisions of AISC 341. Perform tests in accordance with applicable requirements of AWS D1.8/D1.8M.
 - 4. MT inspection of k-area base metal in web, where welding of continuity plates, doubler plates or stiffener plates occur in k area.
 - 5. MT inspection of beam-to-column CJP's.
 - 6. UT testing of base metal, including baseplates, thicker than 1-1/2 inches for laminations where connected material is greater than 3/4 inches.
 - 7. MT testing of beam copes and access holes at welded connections where flanges are thicker than 1-1/2 inches.
- E. Rejected Welds: Repair all rejected welds. If more than 10 percent of any weld type is rejected, test an additional 20 percent of remaining welds in same manner. If more than 10 percent of additional welds are rejected, test an additional 20 percent of remaining welds. If more than 10 percent of these welds are rejected, retest all welds.

3.06 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing per ASTM A780/A780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION

SECTION 05 3100 STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof deck.
- B. Supplementary deck reinforcing for openings up to and including 13 inches.

1.02 REFERENCE STANDARDS

- A. AISI S100-12 North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. ANSI/SDI RD Standard for Steel Roof Deck.
- C. ANSI/SDI NC Standard for Non-Composite Steel Floor Deck
- D. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- E. ASTM A510/A510M Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel.
- F. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- H. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- I. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- J. AWS D1.1/D1.1M Structural Welding Code Steel.
- K. AWS D1.3/D1.3M Structural Welding Code Sheet Steel.
- L. IAS AC172 Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.
- M. ICC-ES AC70 Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements.
- N. SDI COSP Code of Standard Practice; Steel Deck Institute.

1.03 SUBMITTALS

- A. Product Data: Provide for each type of deck, accessory, and product provided; deck profile characteristics, dimensions, structural properties, and finishes.
- B. Shop Drawings: Indicate deck plan, support locations and details, projections, openings, reinforcement, pertinent details, and accessories.
- C. Certificates: Certify that products furnished meet or exceed specified requirements.
- D. Submit manufacturer's installation instructions.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.

- C. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI COSP Code of Standard Practice.
- B. Calculated structural characteristics of steel deck shall comply with AISI S100-12.

2.02 MANUFACTURERS

- A. Steel Deck:
 - 1. Canam Steel Corporation: www.canam-steeljoists.ws.
 - 2. Epic Metals Corporation : www.epicmetals.
 - 3. Marlyn Steel Decks, Inc.; www.marlynsteel.com
 - 4. New Millennium Building Systems, LLC: www.newmill.com.
 - 5. Nucor-Vulcraft Group: www.vulcraft.com.

2.03 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 80/550, Class 1, with G90/Z275 galvanized coating.
 - 2. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 - 3. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 - 4. Structural Properties:
 - 5. Minimum Base Metal Thickness: As indicated on Drawings.
 - 6. Nominal Height: As indicated on Drawings.
 - 7. Profile: Fluted; SDI WR.
 - 8. Formed Sheet Width: 36 inch.
 - 9. Side Joints: Lapped, mechanically fastened.
 - 10. End Joints: Lapped, mechanically fastened.

2.04 ACCESSORY MATERIALS

- A. Welding Materials: AWS D1.1/D1.1M.
- B. Power Actuated or Pneumatically Driven Fasteners: Steel; with knurled shank, clamping washers, and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
 - 1. Design Requirements: Provide number and type of fasteners that are equivalent to strengh and stiffness of welded connections indicated.
 - 2. Material: Steel; ASTM A510/A510M, Grade 1077.
 - a. Hardness: Rockwell C 54.5, minimum.
 - b. Tensile Strength: 285 kips per square inch, minimum.
 - c. Shear Strength: 175 kips per square inch, minimum.
 - d. Washers:
 - 1) Structural Steel Framing Applications: 0.591 inch diameter, minimum.
 - e. Corrosion Resistance:
 - 1) Roof Deck with Waterproofing Membrane Applications: ASTM B633, SC1, Type III zinc electroplate.
 - 2) Exposed Roof Deck Applications: Provide manufacturer's standard stainless steel sealing caps with bonded neoprene washer over each fastener.
 - 3. Products:

- a. Hilti; X-ENP (Structural Steel).
- C. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
 - 1. Design Requirements for Sidelap Connections: Provide number and type of fasteners indicated.
 - 2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.
- D. Touch-Up Primer for Galvanized Surfaces: <|SSPC-Paint 20|>, complying with VOC limitations of authorities having jurisdiction.
- E. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.05 FABRICATED DECK ACCESSORIES

- A. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359 inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- B. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- C. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factorypunched hole of 3/8 inch minimum diameter.
- D. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- E. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3 inch wide flanges and level recessed pans of 1-1/2 inch minimum depth. For drains, cut holes in the field.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI COSP, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Refer to "Design Requirements" under heading "Accessory Materials". Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- J. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coatings per heading "Repairs and Protection".

3.03 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support.
 - a. As indicated on Drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding that indicated on Drawings, the lesser of one-half of the span or 18 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws. Drive mechanical sidelap connectors completely through adjacent lapped roof deck sheets to achieve positive engagement of adjacent sheets with minimum three thread penetration.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels per deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. All methods of attachment will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor, Construction Manager, and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.05 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint per ASTM A780/A780M and manufacturer's written instructions.

END OF SECTION

SECTION 05 4000 COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior non-load-bearing wall framing.
- B. Ceiling joist framing.
- C. Soffit framing.
- D. Exterior wall framing supporting exterior mounted metal awnings.

1.02 REFERENCE STANDARDS

- A. ACI 318 Building Code Requirements for Structural Concrete.
- B. AISI S100-12 North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. AISI S200 North American Standard for Cold-Formed Steel Framing General Provisions.
- D. AISI S211 North American Standard for Cold-Formed Steel Framing Wall Stud Design.
- E. AISI S212 North American Standard for Cold-Formed Steel Framing Header Design.
- F. AISI S213 North American Standard for Cold-Formed Steel Framing Lateral Design, Supplement 1.
- G. ASTM A1003/A1003M Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- H. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- I. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- J. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
- K. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- L. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- M. ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- N. ASTM C1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- O. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- P. ASTM E1190 Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
- Q. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- R. ASTM E488/E488M Standard Test Methods for Strength of Anchors in Concrete Elements.
- S. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- T. AWS D1.1/D1.1M Structural Welding Code Steel.
- U. AWS D1.3/D1.3M Structural Welding Code Sheet Steel.
- V. ICC-ES AC193 Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- W. ICC-ES AC70 Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements.

X. UL (FRD) - Fire Resistance Directory.

1.03 PRE-INSTALLATION MEETINGS

A. Pre-Installation Conference: Conduct conference at Project site.

1.04 SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Sustainable Design Submittal: Documentation of recycled content and location of manufacture.
- D. Delegated-Design Submittal: For cold-formed steel framing. Include drawings and calculations signed and sealed by the professional engineer responsible for their preparation.
- E. Qualification Data: For testing agency and the professional engineer responsible for Delegated Design.
- F. Welding certificates.
- G. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- H. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code Sheet Steel."

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
 - 1. ClarkDietrich Building Systems, Inc. www.clarkdietrich.com.
 - 2. Consolidated Fabricators Corp ; Building Products Division: www.con-fab.com.
 - 3. MarinoWARE: www.marinoware.com.
 - 4. Steel Network, Inc. (The): www.steelnetwork.com.

2.02 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified licensed professional engineer who is experienced in providing engineering services of the kind indicated to prepare shop drawings and design cold-

formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing and connections to building structure capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
 - b. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degF.
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch.
 - 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
 - 6. Design exterior wall framing to withstand loading from exterior mounted metal awnings.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Wall Studs: AISI S211.
 - 2. Headers: AISI S212.
 - 3. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100-12 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL (FRD) or from the listings of another qualified testing agency.

2.03 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance
 - 2. Coating: G60, A60, AZ50, or GF30.
- C. Steel Sheet for Vertical Deflection or Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 33.
 - 2. Coating: G60.

2.04 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 54 mils.
 - 2. Minimum Flange Width: 1-3/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 33 mils.
 - 2. Flange Width: 1-1/4 inches.

- C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
 - 1. Manufacturers:
 - a. ClarkDietrich Building Systems, Inc.: www.clarkdietrich.com.
 - b. MarinoWARE: www.marinoware.com.
 - c. Steel Network, Inc. (The): www.steelnetwork.com.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
 - 1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
 - a. Minimum Base-Metal Thickness: 68 mils.
 - b. Flange Width: 1 inch plus twice the design gap for other applications.
 - 2. Inner Track: Of web depth indicated, and as follows:
 - a. Minimum Base-Metal Thickness: Match metal stud thickness.
 - b. Flange Width: Same as outer flange width plus 1 inch.
- F. Slotted Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; punched with vertical slots in both legs. Studs should be positively attached to deep leg track using vertical slots while allowing free vertical movement, with flanges designed to support horizontal and leteral loads and transfer them to the primary structure, and as follows:
 - 1. Manufacturers:
 - a. ClarkDietrich Building Systems, Inc.; MaxTrack or SLP-TRK Slotted Deflection Track: www.clarkdietrich.com.
 - b. MarinoWare; Slotted Deflection Track: www.marinoware.com.
 - 2. Minimum Base-Metal Thickness: 43 mils.
 - 3. Flange Width: 1 inch plus twice the design gap.
- G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.
- H. Proprietary Header/Sill System: Preformed, pre-engineered header/sill system for use at openings in cold formed metal framing systems.
 - 1. Manufacturer:
 - a. Cemco; Pro X Header: www.cemcosteel.com.
- I. Proprietary Bridging Bars: Engineered, pre-notched, 16 gage, galvanized sheet steel spacer bar for cold formed metal framing stud walls.
 - 1. Manufacturer:
 - a. ClarkDietrich Building Systems, Inc.; Spazzer Bar: www.clarkdietrich.com.
 - b. Simpson Strong-Tie; SBR Spacer Bracer: www.strongtie.com
 - c. Steel Network, Inc.; Bridge Bar: www.steelnetwork.com.

2.05 CEILING JOIST FRAMING

- A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 54 mils.
 - 2. Minimum Flange Width: 1-5/8 inches.
 - 3. Maximum Spacing: 16 inches.

2.06 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 54 mils.
 - 2. Minimum Flange Width: 1-5/8 inches.
 - 3. Maximum Spacing: 16 inches

2.07 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.08 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M
- B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex head bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process per<|ASTM A153/A153M|>, Grade C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.09 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
- B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
- C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.03 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing per AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated

panels not exceeding 1/16 inch.

- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding,
 - appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 2100 Thermal Insulation, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.04 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches maximum.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

- 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.05 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 - 1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
 - 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:1. Joist Spacing: 16 inches maximum.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on approved Shop Drawings.
 - 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated on approved Shop Drawings. Fasten bridging at each joist intersection as follows:
 - 1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.06 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Architect, Construction Manager, and Contractor.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.07 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in manner acceptable to manufacturer and Installer, to ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 5000 METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Miscellaneous steel framing and supports.
- B. Steel framing and supports for countertops.
- C. Miscellaneous steel trim.
- D. Metal bollards.

1.02 PRODUCTS FURNISHED, BUT NOT INSTALLED, UNDER THIS SECTION

A. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- C. ASTM A27/A27M Standard Specification for Steel Castings, Carbon, for General Application.
- D. ASTM A276/A276M Standard Specification for Stainless Steel Bars and Shapes.
- E. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- F. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
- G. ASTM A47/A47M Standard Specification for Ferritic Malleable Iron Castings.
- H. ASTM A48/A48M Standard Specification for Gray Iron Castings.
- I. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- J. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
- K. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- L. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- M. ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- N. ASTM D1187/D1187M Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- O. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- P. ASTM F2329 Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- Q. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- R. ASTM F594 Standard Specification for Stainless Steel Nuts.
- S. AWS D1.1/D1.1M Structural Welding Code Steel.
- T. IAS AC172 Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.
- U. SSPC-PA 1 Shop, Field, and Maintenance Coating of Metals.
- V. SSPC-Paint 20 Zinc-Rich Coating (Type I Inorganic, and Type II Organic).
- W. SSPC-SP 3 Power Tool Cleaning.

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X. SSPC-SP 6 - Commercial Blast Cleaning.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- C. Samples for Verification: For each type and finish of extruded nosing and tread.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel IAS AC172.
- B. Welding Qualifications: Qualify procedures and personnel per the following:
 1. AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. 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.

2.02 METALS

- 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.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Stainless-Steel Bars and Shapes: ASTM A276/A276M, Type 316L.
- E. Steel Tubing: ASTM A500/A500M or A1085/A1085M, cold-formed steel tubing.
- F. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.03 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum, stainless steel, and 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. 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 2 (A4).
- D. 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.
- E. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329.

2.04 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. 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.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.

2.06 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.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.07 STEEL FRAMING AND SUPPORTS FOR COUNTERTOPS

- A. Provide steel framing and supports for countertops as indicated and necessary to complete the Work.
- B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated. Cut, drill, and tap units to receive hardware, hangers, and similar items.
2.08 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.
- C. Galvanize exterior miscellaneous steel trim.
- D. Prime interior miscellaneous steel trim with zinc-rich primer.

2.09 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Bollard dimensions: 6 inch outside diameter, 6 foot total length; 2 foot imbedment.
- C. Fill with concrete and trowel top to drain.
- D. Fabricate sleeves for bollard anchorage from steel pipe with 1/4 inch- thick steel plate welded to bottom of sleeve.
- E. Prime bollards with zinc-rich primer. Prime for painted finish in field to match existing.

2.10 PIPE AND DOWNSPOUT GUARDS

- A. Fabricate pipe and downspout guards from 3/8 inch- thick by 12 inch- wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch clearance between pipe and pipe guard. Drill each end for two 3/4 inch anchor bolts.
- B. Galvanize pipe and downspout guards.
- C. Prime pipe and downspout guards with zinc-rich primer.

2.11 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 integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

2.13 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
- 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 unless otherwise indicated.
- 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 Section 09 9600 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, for shop painting.

PART 3 EXECUTION

3.01 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.

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- 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.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.02 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch bolts at each bollard unless otherwise indicated.
- C. Anchor bollards in concrete in formed or pre-drilled holes. Fill annular space around bollard solidly with nonshrink grout.
- D. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- E. Fill bollards solidly with concrete, mounding top surface to shed water.

3.03 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

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SECTION 05 5213 PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stair railings and guardrails.

1.02 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design.
- B. AISC 201 AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures.
- C. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
- E. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- G. ASTM A780/A780M Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- H. ASTM C1107/C1107M Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- I. AWS A2.4 Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- J. AWS B2.1/B2.1M Specification for Welding Procedure and Performance Qualification.
- K. AWS D1.1/D1.1M Structural Welding Code Steel.
- L. NAAMM AMP 521 Pipe Railing Systems Manuel.
- M. SSPC-Paint 20 Zinc-Rich Coating (Type I Inorganic, and Type II Organic).

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Railing brackets.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Samples: Submit two, 12 inch long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.
- D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
- E. Fabricator's Qualification Statement.

1.04 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.
- C. Fabricator Qualifications:

- 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
- 2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Dimensions: See drawings for configurations and heights.
 - 1. Top Rails: 1-1/2 inches diameter, round.
 - 2. Intermediate Rails: 1-1/2 inches diameter, round.
 - 3. Posts: 1-1/2 inches diameter, round.
- B. Provide anchors and other components as required to attach to concrete slab, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, core drill slab 12 inch minimum to recieve railing. Fill with non shrink grout and slope finished to install to drain.
- C. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors and flanges.
- D. Welded Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - 1. Ease exposed edges to a small uniform radius.
 - 2. Welded Joints:
 - a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Straight Splice Connectors: Steel concealed spigots.
- F. Galvanizing: In accordance with requirements of ASTM A123/A123M.
 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I Inorganic.
- G. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.03 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.04 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
- B. Accurately form components to suit specific project conditions and for proper connection to building structure.
 - 1. Form changes in direction of railings by bending or inserting prefabricated elbow fittings.
- C. Fit and shop assemble components in largest practical sizes for delivery to site.
- D. Fabricate components with joints tightly fitted and secured.

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- E. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
 - 3. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint as shown in NAAMM AMP 521.
- F. Weld connections in field that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding.
 - 3. Clean welds and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.
- G. Flanges, Fittings, and Anchors: Provide flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- H. Provide anchorage devices as indicated for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.05 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
- B. For galvanized railings, provide hot-dip galvanized fittings, fasteners, sleeves, and other ferrous components.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

A. Clean and strip steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

3.04 TOLERANCES

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

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SECTION 06 1000 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roofing nailers.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Communications and electrical room mounting boards.
- E. Concealed wood blocking, nailers, and supports.
- F. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWPA U1 Use Category System: User Specification for Treated Wood.
- D. PS 20 American Softwood Lumber Standard.
- E. SPIB (GR) Standard Grading Rules.

1.03 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials and application instructions.
- B. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.05 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-C plywood; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested per ASTM E84.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
 - 2. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

- 1. Products:
 - a. Lonza Group: www.wolmanizedwood.com/#sle.
 - b. Hoover Treated Wood Products, Inc: www.frtw.com/#sle.
 - c. Koppers, Inc: www.koppersperformancechemicals.com/#sle.
- 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 - 1. Products:
 - a. Lonza Group: www.wolmanizedwood.com/#sle.
 - b. Koppers Performance Chemicals, Inc:
 - www.koppersperformancechemicals.com/#sle.
 - c. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
 - 2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber less than 18 inches above grade.

- 3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete.
 - d. Treat plywood less than 18 inches above grade.
 - e. Treat plywood in other locations as indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

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

3.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Joints of rigid wall coverings that occur between studs.

3.03 ROOF-RELATED CARPENTRY

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

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size and Location: As indicated on drawings.

3.05 SITE APPLIED WOOD TREATMENT

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

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

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B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

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

SECTION 06 1600 SHEATHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Gypsum wall sheathing.
- B. Sheathing joint and penetration treatment.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus.
- C. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- D. ASTM C1177/C1177M Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- E. ASTM C834 Standard Specification for Latex Sealants.
- F. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- G. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- H. GA-253 Application of Gypsum Sheathing.
- I. UL (DIR) Online Certifications Directory.
- J. UL (FRD) Fire Resistance Directory.

1.03 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL (DIR) "Fire Resistance Directory."

2.02 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C1177/C1177M.
 - 1. Products: Provide the following:.
 - a. CertainTeed Corporation; GlasRoc: www.certainteed.com.
 - b. G-P Gypsum Corporation; Dens-Glass Gold: www.gp.com.
 - c. Continental Building Products; Weather Defense Platinum Sheathing: www.continental-bp.com.
 - d. National Gypsum Company; Gold Bond e(2)XP: www.nationalgypsum.com.
 - e. United States Gypsum Co.; Securock: www.usg.com.

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- 2. Type and Thickness: Type X, 5/8 inch thick.
- 3. Size: 48 by 96 inches for vertical installation.

2.03 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For gypsum wall sheathing, provide fasteners with hot-dip zinc coating per ASTM A153/A153M.
- B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a slt-spray resistance of more than 800 hours per ASTM B117.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
 - 2. For steel framing from 0.033 inch to 0.112 inch thick, use screws that comply with ASTM C954.

2.04 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.
 - 1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.02 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA 253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install boards with a 3/8 inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install boards with a 1/4 inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

- 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
- D. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

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SECTION 06 8316 FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

1.02 REFERENCE STANDARDS

- A. ASTM D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- C. ASTM D5319 Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. FM 4880 Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials.
- F. ISO 846 Plastics Evaluation of the Action of Microorganisms.
- G. ISO 2812-1 Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water.

1.03 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Samples: Submit two samples 8 by 8 inch in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Basis of Design: Marlite, Inc.; www.marlite.com/#sle.
 - 2. Crane Composites, Inc: www.cranecomposites.com/#sle.
 - 3. Nudo Products, Inc: www.nudo.com/#sle.
 - 4. Panolam Industries International, Inc: www.panolam.com/#sle.

2.02 PANEL SYSTEMS

- A. Wall Panels:
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: 0.10 inch.
 - 3. Surface Design: Pebbled.
 - 4. Color: White.
 - 5. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested per ASTM E84.
 - 2. Class 1 fire rated when tested in accordance with FM 4880.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

- 4. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
- 5. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
- 6. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.
- B. Sealant: Type recommended by panel manufacturer; white.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Fill channels in trim with sealant before attaching to panel.
- G. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- H. Remove excess sealant after paneling is installed and prior to curing.

SECTION 07 0553 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Marking and identification for fire and smoke assemblies including:
 - 1. Fire walls.
 - 2. Fire barriers.
 - 3. Fire partitions.
 - 4. Smoke barriers.
 - 5. Smoke partitions.
 - 6. Other assemblies as required.

1.02 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- B. Schedule: Completely define scope of proposed marking. Indicate location of affected walls and partitions, and number of markings.
- C. Samples: Submit two samples of each type of marking proposed for use, of size similar to that required for project, illustrating font, wording, and method of application.

1.04 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Conference: Conduct conference at Project site.

1.05 COORDINATION

A. Coordinate identification of fire and smoke protection assemblies with work of other trades.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Identification and marking of fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions, and other walls or surfaces required by the ICC (IBC) or authorities having jurisdiction (AHJ).
 - 1. Permanently identify with signs or stenciling.
- B. Identification locations:
 - 1. Accessible concealed floor, floor-ceiling, or attic spaces.
 - 2. Within 15 feet of each end of each assembly and at intervals not exceeding 30 feet measured horizontally along the assembly. Avoid locations obstructed by other construction.
 - 3. Lettering: Minimum 3 inches high, with minimum 3/8 inch stroke, in color contrasting with background, and approved by the AHJ.
 - 4. Wording (substitute hour rating for "XX"): (or similar as approved by AHJ):

"XX" HOUR RATED

FIRE AND/OR SMOKE ASSEMBLY

PROTECT ALL OPENINGS AND PENETRATIONS

C. Languages: Provide all markings in English.

PART 3 EXECUTION

3.01 INSTALLATION

A. Identify fire and smoke protection assemblies with preprinted signs or by painting with stencil. Identification shall be visible to anyone seeking to remove, penetrate, or alter fire and smoke protection assemblies and shall be permanent.

- 1. For preprinted signs, use mechanical fasteners or adhesives capable of permanently bonding signs to surfaces on which signs are placed.
- 2. For painted signs; ensure compatibility of coats and substrates.
- 3. Provide identification on each side of assembly.

SECTION 07 1900 WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior, masonry surfaces.

1.02 REFERENCE STANDARDS

- A. ASTM C140/C140M Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- B. ASTM D5095 Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments.

1.03 SUBMITTALS

- A. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.
- B. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Field Reports: Report whether manufacturer's "best practices" are being followed; if not, state corrective recommendations. Email report to Architect the same day as inspection occurs; mail report on manufacturer's letterhead to Architect within 2 days after inspection.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience
- C. Owner reserves the right to provide continuous independent inspection of surface preparation and application of water repellent.

1.05 FIELD CONDITIONS

- A. Protect liquid materials from freezing.
- B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.
- C. Do not apply water repellents when wind velocity is higher than 25 mph.

1.06 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for water reppellent.
 - 1. Include coverage for degradation of waterproofing ability and reduction in graffiti resistance on designated substrate.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:

2.02 MATERIALS

- A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
 - 1. Applications: Vertical surfaces and non-traffic horizontal surfaces.
 - 2. Number of Coats: Two.
 - 3. Moisture Absorption When Applied to Masonry: Five percent, maximum, when tested in accordance with ASTM C140/C140M using masonry sample completely coated with water repellent.
 - 4. Silane, siloxane, silane-siloxane blend, or siliconate that reacts chemically with concrete masonry.
 - a. Manufacturers:
 - 1) BASF Construction Chemicals: www.buildingsystems.basf.com/#sle.
 - 2) Pecora Corporation: www.pecora.com/#sle.
 - 3) Tnemec Inc; Prime-A-Pell Plus 662: www.tnemec.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify joint sealants are installed and cured.
- C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

- A. Protection of Adjacent Work:
 - 1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
 - 2. Protect adjacent surfaces not intended to receive water repellent.
- B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.
- C. Remove loose particles and foreign matter.
- D. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.
- E. Scrub and rinse surfaces with water and let dry.
- F. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

- A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.
- B. Apply at rate recommended by manufacturer, continuously over entire surface.
- C. Apply two coats, minimum.
- D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

SECTION 07 2100 THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at cavity wall construction and exterior wall behind stucco wall finish.
- B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces.
- D. Sound attenuation insulation.

1.02 DEFINITIONS

- A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
 - 1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
 - 2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
 - 3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.03 REFERENCE STANDARDS

- A. ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- B. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. ASTM C726 Standard Specification for Mineral Wool Roof Insulation Board.
- E. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- F. ASTM C764 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.
- G. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- H. ASTM E2357 Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies.

1.04 SUBMITTALS

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

1.05 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MINERAL FIBER BOARD INSULATION MATERIALS

- A. Mineral Wool Block and Board Thermal Insulation: Complying with ASTM C612.
 - 1. Facing: None, unfaced.

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- 2. Flame Spread Index: 25 or less, when tested with facing, if any, in accordance with ASTM E84.
- 3. Smoke Developed Index: 50 or less, when tested with facing, if any, in accordance with ASTM E84.
- 4. Board Thickness: 2 inches.
- 5. Board Edges: Square.
- 6. Products:
 - a. CertainTeed Corporation: www.certainteed.com/#sle.
 - b. Johns Manville: www.jm.com/#sle.
 - c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - d. ROCKWOOL; COMFORTBOARD 110: www.rockwool.com/#sle.

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Mineral Wool Blanket Thermal Insulation: Flexible preformed insulation, complying with ASTM C665.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3. Thermal Resistance: R-value of 11.
 - 4. Thickness: 3 1/2 inch.
 - 5. Products:
 - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
 - b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
 - c. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
 - d. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.

2.03 SOUND ATTENUATION INSULATION MATERIALS

- A. Sound Attenuation Insulation: Mineral fiber insulation; Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
 - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 - 3. Thickness: As indicated on Drawings.
 - 4. Manufacturers:
 - a. Johns Manville International, Inc.; MinWool Sound Attenuation Fire Batts: www.jm.com.
 - b. Thermafiber, Inc; Sound Attenuation Fire Blankets (SAFB): www.thermafiber.com.
 - c. ROCKWOOL; Safe'n'Sound: www.rookwool.com.

2.04 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
- B. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
 - 1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
 - 2. Thickness: 45 mil, 0.045 inch, nominal.
 - 3. Size: 6 inches wide, in rolls 75 feet long.
 - 4. Tensile Strength: Greater than 1,300 psi complying with ASTM D412 test method.
 - 5. Products:
 - a. DuPont de Nemours, Inc; DuraGard CM Transition Flashing: building.dupont.com/#sle.
- C. Insulation Fasteners: Appropriate for purpose intended.
- D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Install rigid insulation directly to exterior grade sheathing at 16 inches on center with manufacturer recommended mechanical fasteners, and tape joints with manufacturer's minimum 4 inches wide sealant tape; comply with ASTM E2357.
- B. Install boards horizontally on walls.
 - 1. Place boards to maximize adhesive contact.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

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SECTION 07 2700 AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air barriers.

1.02 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

- A. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D1970/D1970M Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- E. ASTM E2178 Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, limitations, and installation.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Testing agency qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
 - 1. Air Barrier Coating:
 - a. Material: Silyl-terminated polyester (STPE).
 - b. Dry Film Thickness (DFT): 40 mil, 0.040 inch, minimum.
 - c. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
 - d. Water Vapor Permeance: 11 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure B Water Method, at 73.4 degrees F.

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- e. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
- f. Elongation: 400 percent, minimum, when tested in accordance with ASTM D412.
- g. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
- h. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
- i. VOC Content: Zero.
- j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
- k. Products:
 - 1) Carlisle Coatings and Waterproofing, Inc; Fire Resist Barrithane VP: www.carlisleccw.com/#sle.
 - DuPont de Nemours, Inc; Tyvek Fluid Applied WB+ with Tyvek Fluid Applied Flashing and Joint Compound, Sealant for Tyvek Fluid Applied System, and StraightFlash: building.dupont.com/#sle.
 - 3) Henry Company; Air-Bloc All Weather STPE: www.henry.com/#sle.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Fluid-Applied Coatings or Membranes:
 - 1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 - 2. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.
- E. Openings and Penetrations in Exterior Air Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
 - 2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
 - 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.

- 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
- 6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

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SECTION 07 5400 THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat and tapered.
- C. Cover boards.
- D. Flashings.

1.02 REFERENCE STANDARDS

- A. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM C1177/C1177M Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- C. ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- D. ASTM D6878/D6878M Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing.
- E. ASTM E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- F. FM (AG) FM Approval Guide.
- G. FM DS 1-28 Wind Design.
- H. NRCA (RM) The NRCA Roofing Manual.
- I. NRCA (WM) The NRCA Waterproofing Manual.

1.03 PRE-INSTALLATION MEETING

- A. Pre-Installation Meeting: Convene one week before starting work of this section.
 - 1. Meet with the following parties in attendance:
 - a. Owner.
 - b. Architect.
 - c. Owners insurer if applicable.
 - d. Testing and Inspection Agency.
 - e. Roofing installer.
 - f. Roofing system manufacturers representative.
 - g. Deck installer.
 - h. Installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment
 - 2. Review preparation and installation procedures, including manufacturer's written instructions, and coordinating and scheduling required with related work.
 - 3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- B. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.
- C. Samples for Verification: Submit two samples 12 by 12 inches in size illustrating colored coating.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- G. Manufacturer's qualification statement.
- H. Installer's qualification statement.
- I. Specimen Warranty: For approval.
- J. Reports: Indicating compliance of thermoplastic membrane roofing system system, for Miami-Dade Notice of Acceptance (NOA).
- K. Warranty Documentation:
 - 1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
 - 2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with at least ten years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.
- B. Store materials in weather protected environment, clear of ground and moisture. Place on dunnage, off the ground out of all mud and puddles.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather or when unsuitable weather is anticipated.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 WARRANTY

- A. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after Date of Substantial Completion.
- B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
 - 1. Warranty Term: 20 years.
 - 2. For repair and replacement include costs of both material and labor in warranty.
 - 3. Exceptions are not Permitted:

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Provide thermoplastic roof membrane system having Miami (APD) approval for High Velocity Hurricane Zone.
- D. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated per ASCE 7.
 - 1. Corner Uplift Pressure: As shown on Structural Drawings.
 - 2. Perimeter Uplift Pressure: As shown on Structural Drawings.
 - 3. Field-of-Roof Uplift Pressure: As shown on Structural Drawings.

2.02 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
 - 1. Carlisle SynTec Systems; Sure-Weld TPO: www.carlisle-syntec.com/#sle.
 - 2. Firestone Building Products: www.firestonebpco.com/#sle.
 - 3. GAF; EverGuard TPO 45 mil: www.gaf.com/#sle.
 - 4. Johns Manville; JM TPO 45 mil: www.jm.com/#sle.
 - 5. Mule-Hide Products Co, Inc; Standard TPO: www.mulehide.com/#sle.
 - 6. Versico Roofing Systems; VersiFleece RL TPO RapidLock Membrane: www.versico.com/#sle.
- B. Insulation:
 - 1. BASF Corporation; BASF Neopor GPS: www.neopor.basf.us/#sle.
 - 2. Carlisle SynTec Systems; SecurShield Insulation: www.carlisle-syntec.com/#sle.
 - 3. Firestone Building Products, LLC ISO 95+ GL: www.firestonebpco.com.
 - 4. GAF: www.gaf.com/#sle.
 - 5. Johns Manville Corporation[<>]: www.jm.com.
 - 6. Rmax, Inc.

2.03 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
 - Solar Reflectance Index (SRI): 78, minimum, calculated in accordance with ASTM E1980.
 a. Field applied coating may not be used to achieve specified SRI.
 - 2. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
 - 3. Insulation Thermal Resistance (R-Value): 3 per inch, minimum; provide insulation of thickness required.
- C. Acceptable Insulation Types Constant Thickness Application: Any of types specified.

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- 1. Minimum 2 layers of polyisocyanurate board.
- 2. Bottom layer of polyisocyanurate board covered with single layer of polyisocyanurate board.

2.04 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
 - 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
 - a. Thickness: 45 mil, 0.045 inch, minimum.
 - 2. Sheet Width:
 - Adhered Application: Limit width to 120 inches, maximum, when ambient temperatures are less than 40 degrees F for extended period of time during installation.
 - 3. Solar Reflectance: 0.70, minimum, initial, and 0.65, minimum, 3-year, certified by Cool Roof Rating Council.
 - 4. Thermal Emissivity: 0.86, minimum, initial, and 0.79, minimum, 3-year, certified by Cool Roof Rating Council.
 - 5. Color: White.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.

2.05 COVER BOARDS

- A. Cover Boards: Glass-mat faced gypsum panels complying with ASTM C1177/C1177M.
 - 1. Thickness: 1/2 inch, fire-resistant.
 - 2. Products:
 - a. Georgia-Pacific; DensDeck: www.densdeck.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; DEXcell Glass Mat Roof Board: www.goldbondbuilding.com/#sle.

2.06 INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 - 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 3, 25 psi (172 kPa), minimum.
 - Thermal Resistance, R-value: At 1-1/2 inches thick; Class 1, Grades 1-2-3, 8.4 (1.48), minimum, at 75 degrees F.
 - 2. Board Size: 48 by 96 inches.
 - 3. Board Thickness: as indicated on drawings.
 - 4. Tapered Board: Slope as indicated; minimum thickness 1 inch; fabricate of fewest layers possible.
 - 5. Board Edges: Square.
 - 6. Products:
 - a. Sika Corporation Roofing; Sarnatherm: usa.sarnafil.xika.com. Provide indicated product or appoved equal.

2.07 ACCESSORIES

- A. Sheathing Joint Tape: Paper type, 3 inches wide, self adhering.
- B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
 1. Length as required for thickness of insulation material and penetration of deck substrate, with metal washers.
- C. Liquid Flashing: a two-component polymethyl methacrylate-based (PMMA) liquid flashing material used with Liquid Flashing Gleece to create a monlithic, reinforced flashing membrane.

- 1. Product: Sika; Liquid flashing.
- D. Membrane Adhesive: As recommended by membrane manufacturer.
- E. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- F. Insulation Adhesive: As recommended by insulation manufacturer.
- G. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- H. Sealants: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of ponding water.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 INSTALLATION, GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during cold or wet weather conditions.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate this work with installation of associated counterflashings installed by other sections as the work of this section proceeds.

3.03 INSTALLATION - INSULATION, UNDER MEMBRANE

- A. Attachment of Insulation:
 - 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions and FM DS 1-28 Factory Mutual requirements.
 - 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation manufacturers' instructions.
- B. Cover Boards: Mechanically fasten cover boards in accordance with roofing manufacturer's instructions.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.
- F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- G. Do not install more insulation than can be covered with membrane in same day.
- H. If insulation gets wet, it will be removed from roof and new insulation will be installed.

3.04 INSTALLATION - MEMBRANE

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate recommended by maufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- F. Around roof penetrations, seal flanges and flashings with flexible flashing.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 4000 Quality Requirements for additional requirements.
- B. Provide daily on-site attendance of roofing manufacturer's representative during installation of this work.

3.06 CLEANING

- A. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- B. Repair or replace defaced or damaged finishes caused by work of this section.

3.07 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

SECTION 07 6200 SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.
- B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- A. AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
- E. ASTM D226/D226M Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- F. ASTM D4586/D4586M Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- G. SMACNA (ASMM) Architectural Sheet Metal Manual.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section.
- B. Coordination:
 - 1. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
 - 2. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- B. Samples: Submit two samples, 6 by 6 inches in size, illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.
- B. Maintain one copy of each document on site.
- C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sheet Metal Flashing and Trim Manufacturers:
 - 1. ALUCOBOND USA: www.alucobondusa.com/#sle.
 - 2. Fairview Architectural LLC; VitraEdge [____]: www.fairview-na.com/#sle.
 - 3. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.

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Flad Architects
4. Petersen Aluminum Corporation: www.pac-clad.com/#sle.

2.02 SHEET MATERIALS

- A. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with silicone modified polyester coating.
 - 1. Fluoropolymer Coating: High performance organic powder coating, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.
- B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 Brushed finish.

2.03 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects. Fabricate in shop to greatest extent possible.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 EXTERIOR PENETRATION FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.05 ACCESSORIES

- A. Fasteners: Aluminum, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.
- C. Primer: Zinc chromate type.
- D. Concealed Sealants: Non-curing butyl sealant.
- E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.

- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

3.04 FIELD QUALITY CONTROL

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

END OF SECTION

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SECTION 07 7100 ROOF SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, and gravel stops.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ANSI/SPRI/FM 4435/ES-1 Test Standard for Edge Systems Used with Low Slope Roofing Systems.
- C. NRCA (RM) The NRCA Roofing Manual.

1.03 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. Architectural Products Co: www.archprod.com.
 - 2. Basis of Design: Hickman Edge Systems; Formed Coping Plus: www.hickmanedgesystems.com/#sle.

2.02 COMPONENTS

- A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Fascia, cant, and edge securement for roof membrane.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Exposed Face Height: As indicated on drawings.
 - 4. Material: Formed aluminum sheet, 0.063 inch thick, minimum.
 - 5. Finish: 70 percent polyvinylidene fluoride.
 - 6. Color: As indicated on drawings.
 - 7. Products:
 - a. Hickman Edge Systems; TerminEdge EX Fascia: www.hickmanedgesystems.com/#sle.
- B. Copings: Factory fabricated to sizes required; corners mitered; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
 - Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Material: Formed aluminum sheet, 0.063 inch thick, minimum.
 - 4. Color: As indicated on drawings.
 - 5. Products:

a. Hickman Edge Systems; PermaSnap Premier Coping: www.hickmanedgesystems.com/#sle.

2.03 FINISHES

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

2.04 ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 07 7123 MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.02 REFERENCE STANDARDS

- A. AAMA 2604 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. ASTM A48/A48M Standard Specification for Gray Iron Castings.
- C. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. SMACNA (ASMM) Architectural Sheet Metal Manual.

1.03 ADMINISTRATIVE REQUIREMENTS

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

1.04 SUBMITTALS

- A. Product Data: Provide data on prefabricated components.
- B. Samples: Submit two samples, 12 inch long illustrating component design, finish, color, and configuration.

1.05 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Gutters and Downspouts:
 - 1. ATAS International, Inc: www.atas.com/#sle.
 - 2. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
 - 3. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc: www.saf.com/persys/#sle.

2.02 MATERIALS

- A. Pre-Finished 6061 Aluminum Sheet: ASTM B209/B209M; 0.040 inch thick.
 - 1. Finish: Plain, shop pre-coated with polyvinylidene fluoride (PVDF) coating.
 - 2. Color: As selected from manufacturer's standard colors.

2.03 COMPONENTS

- A. Gutters: SMACNA rectangular style profile.
- B. Downspouts: SMACNA rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Gutter Supports: Brackets.
 - 2. Downspout Supports: Brackets.
- D. Fasteners: Stainless steel, with soft neoprene washers.

2.04 FABRICATION

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

2.05 FINISHES

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604, multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.06 ACCESSORIES

- A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
 - 1. Configuration: Angular.
 - 2. Size: Match downspout required.
 - 3. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
 - 4. Finish: Manufacturer's standard factory applied powder coat finish.
 - 5. Color: To be selected by Architect from manufacturer's standard range.
 - 6. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, and rubber coupling.
 - 7. Products:
 - a. Downspoutboots.com, a division of J. R. Hoe & Sons; N-Series, 40 inch long: www.downspoutboots.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
 1. Install gutter expansion joints at runs longer than 40 feet.
- B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- C. Slope gutters 1/32 inch per foot, 2 percent minimum .
- D. Connect downspouts to downspout boots at 30 inches above grade. Seal connection watertight.
- E. Connect downspouts to storm sewer system. Grout connection watertight.

END OF SECTION

SECTION 07 8413 PENETRATION FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Penetrations in fire-resistance-rated floors and walls.
- B. Penetrations in horizontal assemblies.
- C. Penetrations in smoke barriers.

1.02 REFERENCE STANDARDS

- A. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- B. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- C. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems.
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. FM (AG) FM Approval Guide.
- F. FM 4991 Approval Standard of Firestop Contractors.
- G. ITS (DIR) Directory of Listed Products.
- H. UL (FRD) Fire Resistance Directory.
- I. UL 1479 Standard for Fire Tests of Penetration Firestops.
- J. UL 2079 Standard for Tests for Fire Resistance of Building Joint Systems.

1.03 DEFINITIONS

- A. Firestopping: Use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating for that floor or wall assembly.
- B. Firestop System: Use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), and/or a specific construction gap, to achieve a fire rated barrier.
- C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and/or smoke rating.
- D. Through-Penetration: Any penetration of a fire-rated wall or floor assembly that completely breaches the barrier.
- E. Membrane-Penetration: Any penetration of a fire-rated wall or floor assembly that breaches only one side of the barrier.
- F. Construction Gaps: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications; edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, firestopping system must comply with UL 2079 for dynamic joints.
- G. F-Rating: The amount of time a firestop can withstand direct flame without burning through barrier per ASTM E814/UL 1479.
- H. T-Rating: The amount of time a through-penetration firestop limits the temperature rise on the cold side (outside test furnace) per ASTM E814/UL 1479 .
- I. L-Rating: A measure of the ability of the fire-resistive assembly to prevent air passage through the firestopping system. Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, for smoke partitions.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product literature for each type of firestop product to be installed on Project. Indicate uses, performance and limitation criteria, and test data.

- 1. SUBMIT DATA FOR EACH TYPE OF FIRESTOPPING FOR EACH SPECIFIC CONDITION AND EACH SPECIFIC APPLICATION.
 - a. UL report with illustration of system and system number.
 - Where a particular condition does not conform to a tested firestopping system design, SUBMIT an "Engineering Judgement Report" with illustrations signed by Firestopping Manufacturer's chief fire protection engineer for review and acceptance by authorities having jurisdiction.
 - b. Fire and temperature rating data.
 - c. Certification that components are asbestos free.
- B. Shop Drawings: Show materials, installation methods, and relationships to adjacent construction for each through fire-penetration fire stop system, each type of construction condition penetrated, each type of penetrating item; and each fire resistive joint system.
 - 1. SUBMIT SHOP DRAWINGS FOR EACH SPECIFIC INSTALLATION CONDITION. Identify intended products and applicable UL Design No.
 - 2. Where Project conditions require modification of a qualified testing and inspection agency's system to suit a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer.
- C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- D. Qualification Data: For qualified Installer.
- E. Installer Certificates: From Installer indicating penetration firestopping has 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 penetration firestopping.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icces.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Single Source Manufacturer: Penetration firestopping systems for each type of penetration and each penetration condition shall be from a single source manufacturer.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- D. Installer Qualifications: A firm that has been approved by FM Global per FM 4991 Approval of Firestop Contractors, or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
 - 1. Manufacturer's willingness to sell its penetration firestopping products to Construction Manager or to Installer engaged by Construction Manager does not in itself confer qualification on buyer.

1.06 PRE-INSTALLATION MEETING

A. Pre-Installation Meeting: Conduct meeting at Project site minimum two weeks prior to start of firestopping installation and associated work.

- 1. Meet at the Project Site with the following parties in attendance.
 - a. Owner.
 - b. Architect.
 - c. Construction Manager.
 - d. Firestopping Contractor.
 - e. Firestopping Manufacturer's Representative.
 - f. Installers of associated work, including architectural, mechanical, electrical, and communications trades work.
 - g. Other parties concerned with performance of firestopping, including authorities having jurisdiction.
- 2. Review submittals for each specific condition.
- 3. Review each condition specific firestopping material and installation method.
- 4. Tour representative areas where firestopping is to be installed.
 - a. Inspect and discuss each type of condition and each type of substrate to be encountered.
 - b. Discuss preparation work required to be performed by other trades.
- B. Construction Manager shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
 - 1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

1.07 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.08 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and resist passage of smoke and other gases. Firestop systems shall maintain the original fire resistance rating of floor, wall, or partition assembly in which firestop system is being installed.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas.
 - 1. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 - 2. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 sq. in. in overall cross sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

2.02 PENETRATION FIRESTOPPING

- A. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire-barrier walls, smoke-barrier walls, and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- B. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- C. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
 - 1. Color: All exposed firestopping shall have a readily identifiable color (not white) to allow for visual inspection during construction.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-wool-fiber or 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. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.03 FILL MATERIALS

- A. 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.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. 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 nonshrinking, homogeneous mortar.
- H. 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. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. 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 sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.
- K. Safing Insulation: Mineral fibers formed into blankets, complying with ASTM C665, rated noncombustible by NFPA per ASTM E84, density not less than 4.0 lbs. per. cu. ft., fire resistant per ASTM E119, formulated for fire containment at floor perimeters.
 - 1. Safing Clips: Galvanized steel safing clips approved by safing insulation manufacturer for holding insulation in place.
 - 2. Caulking Compound: Material approved by safing insulation manufacturer for sealing joint between foil backing of safing insulation and edge of adjacent construction against penetration of smoke.

2.04 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 CONDITIONS REQUIRING FIRESTOPPING

- A. Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such material is designated as insulation, safing, or otherwise.
 - 1. Insulation types specified in other Sections shall not be installed in lieu of firestopping material specified herein.
- B. Penetrations: Included are conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
 - 1. Where a penetration occurs through a structural floor or roof, except slab on grade, and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces per ASTM E814 and UL 2079 for dynamic movement.
 - 2. Where penetrations occur at fire-rated walls or partitions of solid type construction, provide firestopping to completely fill spaces around the penetration, per ASTM E814.

- 3. Where penetrations occur at fire-rated walls or partitions of hollow type construction, provide firestopping to completely fill spaces around the penetration, on each side of the wall or partition, per ASTM E814.
- 4. Requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons, or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall opening.
- C. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction in manner essentially the same as specified herein before.

3.03 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with 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 penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. 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 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 penetration firestopping 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 firestopping's seal with substrates.

3.04 INSTALLATION

- A. General: Install penetration firestopping 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 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 firestopping.
- C. Install fill materials for firestopping 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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.05 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. 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:

"Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

Contractor's name, address, and phone number.

Designation of applicable testing and inspecting agency.

Date of installation.

Manufacturer's name.

Installer's name.

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3.06 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.07 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping 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 penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.08 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL (FRD) under product Category XHEZ.
 - 1. Wall Penetration Systems
 - a. Concrete or masonry walls with a minimum thickness less than or equal to 8 inches.
 - 1) UL-Classified Products WJ Series or CJ Series.
 - b. Framed walls.
 - 1) UL-Classified Products WL Series or CL Series.

END OF SECTION

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SECTION 07 8443 JOINT FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Joints in or between fire-resistance-rated constructions.
- B. Joints at exterior curtain-wall/floor intersections.
- C. Joints in smoke barriers.

1.02 REFERENCE STANDARDS

- A. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. ASTM E1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- C. ASTM E2307 Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.
- D. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems.
- E. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. FM (AG) FM Approval Guide.
- G. FM 4991 Approval Standard of Firestop Contractors.
- H. ITS (DIR) Directory of Listed Products.
- I. SCAQMD 1168 Adhesive and Sealant Applications.
- J. UL (FRD) Fire Resistance Directory.
- K. UL 1479 Standard for Fire Tests of Penetration Firestops.
- L. UL 2079 Standard for Tests for Fire Resistance of Building Joint Systems.

1.03 DEFINITIONS

- A. Firestopping: Use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating for that floor or wall assembly.
- B. Firestop System: Use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), and/or a specific construction gap, to achieve a fire rated barrier.
- C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and/or smoke rating.
- D. Construction Gaps: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications; edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, firestopping system must comply with UL 2079 for dynamic joints.
- E. Perimeter Firebarrier System: Fire-rated floor assembly, non-rated curtain wall assembly, and linear void between adjacent curtain wall and floor assembly, and materials used to prevent passage of flames and hot gasses through it or the occurrence of flames on its unexposed side.
- F. F-Rating: The amount of time a firestop can withstand direct flame without burning through barrier per ASTM E814/UL 1479.
- G. T-Rating: The amount of time a through-penetration firestop limits the temperature rise on the cold side (outside test furnace) per ASTM E814/UL 1479.
- H. L-Rating: A measure of the ability of the fire-resistive assembly to prevent air passage through the firestopping system. Provide firestop systems with L ratings, in addition to F and T ratings, as determined per UL 1479, for smoke partitions.

1.04 SUBMITTALS

- A. Product Data: Manufacturer's product literature for each type of firestop product to be installed on Project. Indicate uses, performance and limitation criteria, and test data.
 - 1. SUBMIT DATA FOR EACH TYPE OF FIRE-RESISTIVE JOINT SYSTEM FOR EACH SPECIFIC CONDITION AND EACH SPECIFIC APPLICATION.
 - a. Identify intended products and applicable UL Design No.
 - b. UL report with illustration of system and system number.
 - 1) Where a particular condition does not conform to a tested fire-resistive joint system design, SUBMIT an "Engineering Judgement Report" with illustrations signed by Fire-Resistive Joint System Manufacturer's chief fire protection engineer for review and acceptance by authorities having jurisdiction.
 - c. Fire and temperature rating data.
 - d. Certification that components are asbestos free.
- B. Shop Drawings: Show materials, installation methods, and relationships to adjacent construction for each through fire-resistive joint system, each type of construction condition, and each fire resistive joint system.
 - 1. SUBMIT SHOP DRAWINGS FOR EACH SPECIFIC INSTALLATION CONDITION. Identify intended products and applicable UL Design No.
 - 2. Where Project conditions require modification of a qualified testing and inspection agency's system to suit a particular fire-resistive joint system, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer.
- C. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
 - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- 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.

1.05 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icces.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Single Source Manufacturer: Penetration firestopping systems for each type of penetration and each penetration condition shall be from a single source manufacturer.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- D. Installer Qualifications: A firm that has been approved by FM Global according to FM 4991 -Approval of Firestop Contractors, or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
 - 1. 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.

1.06 PRE-INSTALLATION MEETING

- A. Pre-Installation Meeting: Conduct meeting at Project site minimum two weeks prior to start of firestopping installation and associated work.
 - 1. Meet at the Project Site with the following parties in attendance.
 - a. Owner.
 - b. Architect.
 - c. Construction Manager.
 - d. Firestopping Contractor.
 - e. Firestopping Manufacturer's Representative.
 - f. Installers of associated work, including architectural, mechanical, electrical, and communications trades work.
 - g. Other parties concerned with performance of firestopping, including authorities having jurisdiction.
 - 2. Review submittals for each specific condition.
 - 3. Review each condition specific firestopping material and installation method.
 - 4. Tour representative areas where firestopping is to be installed.
 - a. Inspect and discuss each type of condition and each type of substrate to be encountered.
 - b. Discuss preparation work required to be performed by other trades.
- B. Contractor shall record discussion, including agreement or disagreement on significant matters. Furnish copies of report to all parties present within 5 days after meeting date.
 - 1. If substantial disagreements exist at conclusion of meeting, determine how disagreements will be resolved, and set date and time to reconvene meeting.

1.07 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.

1.08 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

2.01 PERFORMANCE REQUIREMENTS

- A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

2.02 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.

- 1. Color: All exposed firestopping shall have a readily identifiable color (not white) to allow for visual inspection during construction.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E1996 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.
- C. 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.
- D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smokedeveloped indexes of less than 25 and 450, respectively, as determined per ASTM E84.
 - 1. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- E. 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

3.01 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.

3.02 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.

3.03 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 fireresistance 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.

3.04 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 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:

"Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."

Contractor's name, address, and phone number. Designation of applicable testing agency. Date of installation. Manufacturer's name. Installer's name.

3.05 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.

3.06 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 fireresistive 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 fireresistive joint systems complying with specified requirements.

3.07 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL (FRD) under product Category XHBN or Category XHDG.
- B. Fire-Resistive Joint Systems
 - 1. Materials listed in UL "Fire Resistance Directory" under product Category XHBN for the following systems:
 - a. Floor-to-Wall Joint System
 - 1) UL-Classified Products FW-D 1000 Series.
 - 2) Movement Capabilities: Class II 25 percent compression and/or extension.
 - b. Head-of-Wall Joint System
 - 1) UL-Classified Products HW-D 0000 Series or 1000 Series
 - 2) Movement Capabilities: Class II 33 percent compression and/or extension for 0000 Series, 12.5 percent compression and/or extension for 1000 Series.
 - c. Wall-to-Wall Joint System:
 - 1) UL-Classified Products WW-D 1000 Series

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Project No. 23245-00 Joint Firestopping Section 07 8443 - 5 2) Movement Capabilities: Class II - 25 percent compression and/or extension. END OF SECTION

SECTION 07 9200 JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Silicone joint sealants.
- B. Latex joint sealants.
- C. Preformed joint sealants.

1.02 REFERENCE STANDARDS

- A. ASTM C1193 Standard Guide for Use of Joint Sealants.
- B. ASTM C1330 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- C. ASTM C834 Standard Specification for Latex Sealants.
- D. ASTM C920 Standard Specification for Elastomeric Joint Sealants.

1.03 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
 - 9. Certification by manufacturer indicating that product complies with specification requirements.
- B. 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.
- C. 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 6 inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. 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.
- E. Qualification Data: For qualified Installer.
- F. Warranties: Sample of special warranties.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least five years of experience.
- C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.05 PRE-INSTALLATION MEETING

A. Pre-Installation Meeting: Conduct meeting at Project site.

1.06 FIELD MOCK-UP

- A. Prior to start of sealant work, apply beads of sealant to each substrate in field, to verify colors selected by Architect.
 - 1. Provide sealant mock-up for each substrate and each color of substrate.
 - 2. Sealant beads shall be minimum 24 inches long.
 - 3. Sealant colors shall be same colors selected by Architect.
- B. Do not proceed with building sealant work until sealant colors used for field mock-ups are verified by Architect.

1.07 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 jointsealant manufacturer or are below 40 degF.
 - 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.

1.08 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.
- 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

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.
 - 1. Products:
 - a. Dow Corporation; Dowsil 790: www.dowcorning.com.
 - b. GE Construction Sealants, licensed by Momentive Performance Materials; SCS2700 SilPruf LM: www.siliconeforbuilding.com.

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- c. Pecora Corporation; 890NST: www.pecora.com.
- d. Tremco Incorporated; Spectrum 1: www.tremcosealants.com.
- B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, for Use NT.
 - 1. Products:
 - a. Dow Corporation; Dowsil 756 SMS: www.dowcorning.com.
 - b. GE Construction Sealants, licensed by Momentive Performance Materials; GE SCS9000 SilPruf NB: www.siliconeforbuilding.com.
 - c. Pecora Corporation; 864 NST: www.pecora.com.
 - d. Tremco Incorporated; Spectrem 3: www.tremcosealants.com.
- C. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.
 - 1. Products:
 - a. Dow Corporation; Dowsil 790: www.dowcorning.com.
 - b. Pecora Corporation; 301 NS: www.pecora.com.
 - c. Tremco Incorporated; Spectrem 800: www.tremcosealants.com.
- D. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
 - 1. Products:
 - a. Dow Corporation; Dowsil 890-SL: www.dowcorning.com.
 - b. Pecora Corporation; 300 SL: www.pecora.com.
 - c. Tremco Incorporated; Spectrum 800/900 SL: www.tremcosealants.com.
- E. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products:
 - a. Dow Corporation; Dowsil 786 Mildew Resistant: www.dowcorning.com.
 - b. GE Construction Sealants, licensed by Momentive Performance Materials; SCS1700 Sanitary: www.siliconeforbuilding.com.
 - c. Tremco Incorporated; Tremsil 200 Sanitary: www.tremcosealants.com.

2.03 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.
 1. Products:
 - a. Pecora Corporation; AC-20+: www.percora.com.
 - b. Tremco Incorporated; Tremflex 834: www.tremcosealants.com.

2.04 PREFORMED JOINT SEALANTS

- A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured lowmodulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
 - 1. Products:
 - a. Dow Corporation; Dowsil 123 Silicone Seal: www.dowcorning.com.
 - b. Tremco; Spectrem Simple Seal: www.tremcosealants.com.
- 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 side with a pressure-sensitive adhesive and covered with protective wrapping.
 - 1. Products:
 - a. EMSEAL Joint Systems, Ltd.; Emseal 25V: www.emseal.com.
 - b. Schul International, Inc.; Sealtite: www.schul.com.
 - c. Willseal USA, LLC; Willseal 150: www.willsealusa.com.

2.05 JOINT SEALANT BACKING

- A. Provide sealant backings of material that are nonstaining; 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.

2.06 MISCELLANEOUS MATERIALS

- A. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- B. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 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.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove 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.
 - 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.
- 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.

3.03 INSTALLATION OF JOINT SEALANTS

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

- B. Sealant Installation Standard: Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. 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.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
- H. 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.
- I. 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.

3.04 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as Work progresses by methods and with cleaning materials approved in writing by joint sealant manufacturers and of products in which joints occur.

3.05 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. Cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.06 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 - 2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Control and expansion joints in unit masonry.
 - c. Joints between metal panels.

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- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - 1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Other joints as indicated.
 - 2. Silicone Joint Sealant: Single component, nonsag, traffic grade, Single component, pourable, traffic grade, or Multicomponent, pourable, traffic grade, neutral cure.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Vertical joints on exposed surfaces of interior masonry and concrete walls and partitions.
 - c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - d. Other joints as indicated.
 - 2. Joint Sealant: Latex, Acrylic based, or Butyl rubber based.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Joints between counters and adjacent wall surfaces.
 - c. Control and expansion joints where indicated.
 - d. Other joints as indicated.
 - 2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

SECTION 07 9219 ACOUSTICAL JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Acoustical joint sealants.
- B. Acoustical outlet box backer pad.

1.02 REFERENCE STANDARDS

- A. ASTM C1193 Standard Guide for Use of Joint Sealants.
- B. ASTM C834 Standard Specification for Latex Sealants.
- C. ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications.
- D. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.03 SUBMITTALS

- A. Product Data: For each acoustical joint sealant and acoustical outlet backer pad. that includes the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
 - 9. Certification by manufacturer indicating that product complies with specification requirements.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- 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 acoustical joint sealant required, provide Samples with joint sealants in 1/2 inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Acoustical-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. Product Test Reports: For each kind of acoustical joint sealant and acoustical outlet box backer pad, for tests performed by a qualified testing agency.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section and with at least five years of experience.
- B. Source Limitations: Obtain each kind of acoustical joint sealant from single source from single manufacturer.

1.05 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E90.
 - 1. Acoustical sealants and sealant primers shall have a VOC content of 250 g/L or less.

2.02 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
 - 1. Products:
 - a. Accumetric LLC; BOSS 826 Acoustical Sound Sealant: www.accumetricinc.com.
 - b. GE Construction Sealants; RCS20 Acoustical: www.siliconeforbuilding.com.
 - c. Grabber Construction Products; Acoustical Sealant GSC: www.grabberman.com.
 - d. Henkel Corporation; OSI Pro-Series SC-175 Acoustical Sound Sealant: www.ositough.com.
 - e. Hilti, Inc.; CS-S SA Light Smoke and Acoustic Sealant: www.hilti.com.
 - f. Pecora Corporation; AC-20 FTR: www.pecora.com.
 - g. Pabco Gypsum; Quiet Seal Pro: www.pabcogypsum.com.
 - h. Tremco, Incorporated; Tremco Acoustical Sealant: www.tremcosealants.com.
 - i. USG Corporation; SHEETROCK Acoustical Sealant: www.usg.com.
 - 2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors.

2.03 ACOUSTICAL OUTLET BOX BACKER PADS

- A. Acoustical Outlet Box Backer Pads: Manufacturer's standard precut mastic putty pads for sealing two-receptacle outlet boxes.
 - 1. Non-Fire Rated:
 - a. ATS Acoustics; Putty Pads: www.atsacoustics.com.
 - b. Kinetics Noise Control; Sealtight Outlet Box Backer Pad: wwwkineticsnoise.com.
 - c. Pabco Gypsum; Quiet Putty 380: www.pabcogypsum.com.
 - 2. Fire-Rated:
 - a. Hilti, Inc.; Firestop Putty Pad CP617 or CFS-P PA: www.hilti.com.
 - b. 3M; Fire Barrier Moldable Putty Pads MPP+: www.3m.com.
 - c. Rectorseal LLC; Metacaulk Fire Rated Putty Pads: www.metacaulk.com.
 - d. Specified Technologies In. (STI); Spec-Seal SSP Putty Pads: www.stifirestop.com.
- B. Pad Size: As standard with manufacturer by 1/8 inch thick.

2.04 MISCELLANEOUS MATERIALS

- A. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- B. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

- C. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- D. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. 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.

3.03 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- C. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.
- D. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.04 INSTALLATION OF ACOUSTICAL OUTLET BOX BACKER PADS

- A. Comply with acoustical backer pad manufacturer's written installation instructions unless more stringent requirements apply.
- B. Form pad to fit shape of outlet box and seal to wall substrate with acoustical joint sealant.
- C. If portion of outlet box is still exposed after application of backer pad, use second pad to wrap remainder of outlet box still exposed.
- D. Seal perimeter of outlet box and backer pad to wall substrate with sealant recommended by backer pad manufacturer.

3.05 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 acoustical joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect acoustical 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. Cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 1113 HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Hurricane-resistant hollow metal doors and frames.
- F. Accessories, including glazing, louvers, and matching panels.

1.02 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. HMMA: Hollow Metal Manufacturers Association.
- C. NAAMM: National Association of Architectural Metal Manufacturers.
- D. NFPA: National Fire Protection Association.
- E. SDI: Steel Door Institute.
- F. UL: Underwriters Laboratories.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design.
- B. ANSI/SDI A250.11 Recommended Erection Instructions for Steel Frames.
- C. ANSI/SDI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- D. ANSI/SDI A250.6 Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- E. ANSI/SDI A250.8 Specifications for Standard Steel Doors and Frames (SDI-100).
- F. ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- G. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- H. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- I. ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- J. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- K. ICC A117.1 Accessible and Usable Buildings and Facilities.
- L. ITS (DIR) Directory of Listed Products.
- M. NAAMM HMMA 840 Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.
- N. NAAMM HMMA 861 Guide Specifications for Commercial Hollow Metal Doors and Frames.
- O. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
- P. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives.
- Q. NFPA 252 Standard Methods of Fire Tests of Door Assemblies.

- R. SDI 117 Manufacturing Tolerances for Standard Steel Doors and Frames.
- S. UL (DIR) Online Certifications Directory.
- T. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies.
- U. UL 1784 Standard for Air Leakage Tests of Door Assemblies.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.05 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
 - 1. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 2. Dimensioned profiles and metal thicknesses of door frames.
 - 3. Locations of reinforcement and preparations for hardware.
- C. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.
- H. Schedule: 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 final Door Hardware Schedule.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years experience.
- B. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of experience.
- D. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Assa Abloy Ceco or Curries: www.assaabloydss.com.
 - 2. Pioneer Industries, Inc.: www.pioneerindustries.com
 - 3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 4. Steelcraft, an Allegion brand: www.allegion.com/us.

- B. Hurricane-Resistant Hollow Metal Doors and Frames:
 - 1. Krieger Specialty Products: www.kriegerproducts.com/#sle.
 - 2. Megamet Industries, Inc; MegaStorm Hurricane and Tornado Doors: www.megametusa.com/#sle.
 - 3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 4. Steelcraft an Allegion brand: www.allegion.com/us.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
 - 4. Door Edge Profile: Manufacturers standard for application indicated.
 - 5. Typical Door Face Sheets: Flush.
 - 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
 - 7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Type HM1, Exterior Doors: Thermally insulated.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 Extra Heavy-duty.
 - b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 Full Flush.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 2. Door Core Material: Vertical steel stiffeners with fiberglass batts.
 - a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
 - 3. Door Thermal Resistance: R-Value of 2.50 min.
 - 4. Door Thickness: 1-3/4 inches, nominal.
- C. Type HM2 , Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 Full Flush.
 - d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
 - 2. Door Thickness: 1-3/4 inches, nominal.
 - 3. Door Face Sheets: Flush.
- D. Type HM3, Fire-Rated Doors:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

- a. Level 2 Heavy-duty.
- b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
- c. Model 1 Full Flush.
- d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
- 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - b. Attach fire rating label to each fire rated unit.
 - c. Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - 1) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - 2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
 - 3) Label: Include the "S" label on fire-rating label of door.
- 3. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
 - 1. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 - 2. Weatherstripping: Refer to Section 08 7100 .
- D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Door Frames, Fire-Rated: Full profile/continuously welded type.1. Fire Rating: Same as door, labeled.
- F. Hurricane-Resistant Door Frames: With same hurricane resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.
 - 1. Frame Metal Thickness: 16 gauge, 0.053 inch, minimum.
- G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- H. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
- I. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

- A. Glazing: As specified in Section 08 8000, factory installed.
- B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- C. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Pack frames in metal stud partitions solidly with mineral fiber insulation
- D. Install door hardware as specified in Section 08 7100.
 - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- E. Touch up damaged factory finishes.

3.03 TOLERANCES

- A. Frame Installation Tolerances: As specified in ANSI/SDI A250.11.
 - 1. Opening Width: Plus or minus 1/16 inch, measured rabbet to rabbet at top, middle, and bottom of frame.
 - 2. Opening Height: Plus 1/16 inch, minus 1/32 inch. measured vertically between the frame head rabbet and top of floor or bottom of frame minus jamb extensions at each jamb and across the head.
 - 3. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb, and perpendicular to frame head.
 - 4. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 5. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 6. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- B. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
 - 1. Non-Fire-Rated 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.
- C. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.
- B. 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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SECTION 08 1116 ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glazed aluminum doors.
- B. Aluminum frames.
- C. Glazing.

1.02 REFERENCE STANDARDS

- A. AAMA 609 & 610 Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- B. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- C. ADA Standards 2010 ADA Standards for Accessible Design.
- D. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM B209/B209M Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- F. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- H. ASTM E2112 Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- I. ICC A117.1 Accessible and Usable Buildings and Facilities.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's descriptive literature for each type of door; include information on fabrication methods.
- B. Shop Drawings: Include elevations of each opening type.
- C. Verification Samples: Two actual pieces of products in each finish specified, not less than 6 inches square or 6 inches long for linear components. For finishes subject to color variation, include not less than two samples illustrating extreme range to be anticipated.
- D. Test Report: Certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.
- E. Installer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than five years of experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum components in manufacturer's standard protective packaging, palleted, crated, or banded together.
- B. Inspect delivered components for damage and replace. Repaired components will not be accepted.
- C. Store components in clean, dry, indoor area, under cover in manufacturer's packaging until installation.
- D. Protect materials and finish from damage during handling and installation.

1.06 FIELD CONDITIONS

A. Do not begin installation of interior aluminum components until space has been enclosed and ambient thermal conditions are being maintained at levels consistent with final project requirements.

1.07 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for defects in workmanship and materials. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glazed Aluminum Doors:
 - 1. Wilson Partitions; WS512 Wide Stile: www.wilsonpart.com/#sle.
- B. Aluminum Frames:
 - 1. Wilson Partitions; 350 Series: www.wilsonpart.com/#sle.

2.02 DOORS AND FRAMES

- A. Accessibility: Comply with ICC A117.1 and ADA Standards.
- B. Glazed Aluminum Doors: Extruded aluminum tube frame, full glazed, with middle rail; factory glazed.
 - 1. Thickness: 1-3/4 inches, nominal.
 - 2. Stile Width: 4 inches, nominal.
 - 3. Exterior Door Finish: Class I Natural anodized.
 - 4. Interior Door Finish: Class II Natural anodized.
 - 5. Texture: Smooth.
 - 6. Seals: Manufacturer's standard.
 - 7. Glazing, Exterior Doors: Sealed insulating units, 1 inch thick, made of clear 1/4 inch thick fully tempered glass.
 - 8. Glazing, Interior Doors: Clear, 1/4 inch thick fully tempered glass.
- C. Aluminum Frames for Doors: Extruded aluminum hollow or C-shaped sections; no steel components.
 - 1. Exterior: Thermally broken.
 - 2. Interior: Non-thermally broken.
 - 3. Frame Depth: To fit wall thicknesses as indicated on drawings.
 - 4. Finish: Same as doors.
- D. Dimensions and Shapes: As indicated on drawings; dimensions indicated are nominal.
 - 1. Provide vision lites as indicated on drawings.
 - 2. Provide the following clearances:
 - a. Hinge and Lock Stiles: 1/8 inch.
 - b. Between Meeting Stiles: 1/4 inch.
 - c. At Top Rail and Bottom Rail: 1/8 inch.

2.03 COMPONENTS

- A. Tubular Doors: Extruded aluminum tubing, 1/8 inch minimum thickness, with heavy-duty plated steel through bolts in rails, glazing stops, and glazing gaskets.
- B. Frames: Extruded aluminum shapes, not less than 0.062 inch thick, reinforced at hinge and strike locations.
 - 1. Corner Brackets: Extruded aluminum, fastened with stainless steel screws.
 - 2. Trim: Extruded aluminum, not less than 0.062 inch thick, removable snap-in type without exposed fasteners.
- C. Door Window Frames: Door window frames with glazing securely fastened within door opening.

- 1. Size: As indicated on drawings.
- D. Vision Lites: Extruded aluminum framed, gasket glazed.

2.04 PERFORMANCE REQUIREMENTS

A. Provide door assemblies that have been designed and fabricated in compliance with specified performance requirements.

2.05 MATERIALS

- A. Aluminum Sheet: ASTM B209/B209M, alloy 5005, temper H14, stretcher leveled.
- B. Extruded Aluminum: ASTM B221 (ASTM B221M), alloy 6063, temper T5, or alloy 6463, temper T5.

2.06 FINISHES

- A. Exterior: Class I Natural Anodized Finish: Clear anodic coating; AAMA 611 AA-M12C22A41, minimum dry film thickness (DFT) of 0.7 mils, 0.0007 inch.
- B. Interior: Class II Natural Anodized Finish: Clear anodic coating; AAMA 611 AA-M12C22A31, minimum dry film thickness (DFT) of 0.4 mil, 0.0004 inch.

2.07 ACCESSORIES

- A. Fasteners: Aluminum, non-magnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.
- B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel or steel hot-dip galvanized in compliance with ASTM A123/A123M.
- C. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil thickness per coat.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.
- B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions.
- B. Replace components with damage to exposed finishes.
- C. Separate dissimilar metals to prevent electrolytic action between metals.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings.
- B. Install exterior doors and frames in accordance with ASTM E2112.
- C. Set frames plumb, square, level, and aligned to receive doors. Anchor frames to adjacent construction in strict accordance with manufacturer's recommendations and within specified tolerances.
- D. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by painting dissimilar metal with heavy coating of bituminous paint.
- E. Hang doors and adjust hardware to achieve specified clearances and proper door operation.

- F. Install door hardware. See Section 08 7100.
- G. Install glazing; set glazing stops and glazing gaskets flush with face of door or frame.
- H. Comply with glazing installation requirements. See Section 08 8000.

3.04 CLEANING

- A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609 & 610.
- B. Do not use abrasive, caustic, or acid cleaning agents.

3.05 PROTECTION

- A. Protect products of this section from damage caused by subsequent construction until Date of Substantial Completion.
- B. Replace damaged or defective components that cannot be repaired to a condition indistinguishable from undamaged components.

END OF SECTION

SECTION 08 1423.17 PLASTIC-FACED WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid-core doors with high-impact plastic faces.
- B. Factory fitting plastic-faced wood doors to frames and factory machining for hardware.

1.02 REFERENCE STANDARDS

- A. ANSI A208.1 American National Standard for Particleboard.
- B. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition.
- C. WDMA I.S. 1A Interior Architectural Wood Flush Doors.
- D. BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames.
- E. DHI WDHS.3 Recommended Locations for Architectural Hardware for Flush Wood Doors.
- F. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives.
- G. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
- H. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies.

1.03 PRE-INSTALLATION MEETINGS

A. Pre-Installation Conference: Conduct conference at Project site.

1.04 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, beveling, blocking for hardware, factory machining, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS).
 - 2. Dimensions and locations of blocking for hardware.
 - 3. Dimensions and locations of mortises and holes for hardware.
 - 4. Dimensions and locations of cutouts.
 - 5. Undercuts.
 - 6. Fire-protection ratings for fire-rated doors.
- C. Samples:
 - 1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide Samples for each finish required.
 - b. Samples shall demonstrate edge wrapping and edge replaceability.
- D. Sample Warranty: For special warranty.
- E. Product Certificates: Fire test certifications for all fire- and smoke-rated products.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than five years of experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.07 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces in accordance with manufacturer's recommendations. Spaces shall be 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 remainder of construction period.

1.08 WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
 - 1. Include coverage for delamination of face material, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic-faced Wood Doors:
 - 1. Construction Specialties, Inc; Acrovyn Flush Doors: www.c-sgroup.com/#sle.
 - 2. Eggers Industries; Palladium Door: www.eggersindustries.com.
- B. Source Limitations: Obtain plastic-faced wood doors from single manufacturer.

2.02 PLASTIC-FACED WOOD DOORS

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S. 1A.
- B. Interior Solid-Core Plastic-faced Doors.
 - 1. Plastic Faces: High-impact resistant, PVC-free plastic.
 - 2. Core: Particleboard; provide mineral-core where required by fire-ratings.
 - 3. Edge Construction: Door stiles and edges shall be field replaceable. Door edges shall be fully wrapped in high-impact plastic cladding.
 - a. Hinge Loading Resistance: Extra Heavy Duty per WDMA T.M.-8.
 - b. Screw-Holding Capability: Extra Heavy Duty per WDMA T.M.-10.
 - 4. Colors: As selected by Architect from manufacture's full range on all exposed surfaces.
 - 5. Texture: Woodgrain.
- C. Performance Grade: WDMA I.S. 1A, Extra Heavy Duty.
- D. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C -Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
 - 1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no ureaformaldehyde.
 - 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.04 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 NFPA 80 requirements for fire-rated doors.
 - Comply with NFFA of requirements for metaled 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, BHMA A156.115W, and hardware templates.

- 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Factory cut and trim openings through doors.
 - 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 8000.

2.05 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 1113.
- B. Glazing: As specified in Section 08 8000.
- C. Fire-resistant Glazing: As specified in Section 08 8813.
- D. Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed 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.

3.02 INSTALLATION

- A. Install doors to comply with manufacturer's written instructions and referenced quality standard.
 1. Install fire-rated doors per NFPA 80.
 - 2. Install smoke- and draft-control doors per NFPA 105.
- B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.03 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.04 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

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SECTION 08 3323 OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior coiling doors.
- B. Electric operators and control stations.
- C. Wiring from electric circuit disconnect to operators and control stations.

1.02 REFERENCE STANDARDS

- A. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
- C. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- F. ASTM E1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- G. ITS (DIR) Directory of Listed Products.
- H. Miami (APD) Approved Products Directory; Miami-Dade County.
- I. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
- J. NEMA ICS 2 Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- K. NFPA 70 National Electrical Code.
- L. UL (DIR) Online Certifications Directory.
- M. UL 325 Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.03 SUBMITTALS

- A. Product Data: Provide general construction, electrical equipment, and component connections and details.
- B. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
 - 1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
 - 2. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
 - 3. Show locations of controls, locking devices, and other accessories.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples: Two slats, 6 inches long illustrating shape, color and finish texture.
- D. Reports: Indicating compliance of overhead rolling doors, for Miami (APD).
- E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

I. Specimen warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years experience and approved by manufacturer.
- C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.05 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide five-year manufacturer warranty for three-ply multifilament polyester fabric curtain. Complete forms in Owner's name and register with manufacturer.
- C. Manufacturer Warranty: Provide 2-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated per ASCE 7.
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
- B. Wind-Borne-Debris Resistance: Provide impact-protective overhead coiling doors having Miami-Dade County approval for Large and Small Missile impact and pressure cycling at design wind pressure when tested per ASTM E1886 and ASTM E1996.
- C. Miami-Dade County, Miami (APD), Approval: NOA #18-1217.08, Missile E impact.

2.02 MANUFACTURERS

- A. DR1 Overhead Coiling Doors:
 - 1. Overhead Door Corporation: 625 Series: www.overheaddoor.com.

2.03 COILING DOORS

- A. Exterior Coiling Doors Type DR1: Steel slat curtain.
 - 1. Capable of withstanding positive and negative wind loads of 20 psf without undue deflection or damage to components.
 - 2. Operation Cycles: Door components and operators capable of operating for not less than 10,000.
 - a. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
 - b. Include tamperproof cycle counter.
 - 3. Sandwich Slats: Manufacturer's standard, with core of foamed-in-place polyurethane insulation; minimum R-value of 4.88.
 - 4. Nominal Slat Size: 2 inches wide by required length.
 - 5. Finish: Galvanized.
 - 6. Finish: Factory painted, color as selected.
 - 7. Guide, Angles: Primed steel.
 - 8. Hood Enclosure: Manufacturer's standard; primed steel.
 - 9. Electric operation.
 - 10. Mounting: Electric Front Mounting.

2.04 MATERIALS AND COMPONENTS

- A. Metal Curtain Construction: Interlocking slats.
 - 1. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
 - 2. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
 - 3. Steel Slats: Minimum thickness, 24 gauge, 3/4 inch; ASTM A653/A653M galvanized steel sheet.
 - a. Galvanizing: Minimum G90 coating.
- B. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.
- C. Guides Angle: ASTM A36/A36M metal angles, size as indicated.
 - 1. Hot-dip galvanized in compliance with ASTM A123/A123M.
 - 2. Prime painted.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
 1. Prime painted.
- E. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.05 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
 - 1. Provide interlock switches on motor operated units.
- B. Electric Operators:
 - 1. Mounting: Side mounted.
 - 2. Motor Enclosure:
 - 3. Motor Rating: 1/3 HP; continuous duty.
 - 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 - 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 - 6. Controller Enclosure: NEMA 250, Type 4.
 - Opening Speed: 12 inches per second.
 a. Provide independently controlled opening and closing speeds.
 - 8. Brake: Manufacturer's standard type, activated by motor controller.
 - 9. Manual override in case of power failure.
 - 10. See Section 26 0583 for electrical connections.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.
- D. Control Station: Provide standard three button, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
 - 1. 24 volt circuit.
 - 2. Surface mounted, at interior door jamb.
 - 3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- E. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.
- B. Notify Architect of any unacceptable conditions or varying dimensions.

3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 26 0583.
- F. Complete wiring from disconnect to unit components.
- G. Install enclosure and perimeter trim.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION

SECTION 08 5113 ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash and infill panels.
- B. Factory glazing.
- C. Insect screens.

1.02 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
- B. AAMA CW-10 Care and Handling of Architectural Aluminum from Shop to Site.
- C. AAMA 609 & 610 Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- D. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- E. AAMA 1503 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- F. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- H. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- I. ASTM E283/E283M Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- J. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- K. ASTM E1332 Standard Classification for Rating Outdoor-Indoor Sound Attenuation.
- L. ASTM E2112 Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- M. ASTM F588 Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
- N. FLA (PAD) Florida Building Code Online Product Approval Directory.

1.03 PRE-INSTALLATION MEETINGS

A. Pre-Installation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.
- B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations, and installation requirements.
- C. Samples:
 - 1. Framing: Two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.
 - 2. Sashes: Two samples, 12 by 12 inch in size illustrating typical corner construction, accessories, and finishes.
- D. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of

those prescribed by specified grade.

- E. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Specimen warranty.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years of experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.08 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.
- D. Manufacturer Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: YKK AP America, Inc.; YVS 410 TUH ProTek Hung Window; www.ykkap.com

2.02 ALUMINUM WINDOWS

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.
 - 1. Frame Depth: 4 inch.
 - 2. Operable Units: Double weatherstripped.
 - 3. Provide factory-glazed units.
 - 4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
 - 5. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 6. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

- B. Single Vertical Sliding Type:
 - 1. Construction: Thermally broken.
 - 2. Provide screens.
 - 3. Glazing: Double; clear; transparent.
 - 4. Exterior Finish: Dark Bronze Anodized Plus.
 - 5. Interior Finish: Dark Bronze Anodized Plus.

2.03 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
 1. Performance Class (PC): R.
- B. Design Pressure (DP): In accordance with applicable codes.
- C. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- D. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code FLA (PAD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
- E. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf.
- F. Air Leakage: 0.1 cfm/sq ft maximum leakage per unit area of outside window frame dimension when tested at 1.57 psf pressure difference in accordance with ASTM E283/E283M.
- G. Condensation Resistance Factor of Frame: 50, measured in accordance with AAMA 1503.
- H. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.
- I. Forced Entry Resistance: Tested to comply with ASTM F588 requirements for performance level of Grade 10 for specific window style required.
- J. Acoustic Performance: Minimum outdoor-indoor transmission class (OITC) rating of 34, when tested in accordance with ASTM E90 and ASTM E1332.

2.04 COMPONENTS

- A. Frames: 2 inch wide by 4 inch deep profile; thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.
- B. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
 - 1. Hardware: Spring loaded steel pins; four per screen unit.
 - 2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
 - 3. Frame Finish: Same as frame and sash.
- C. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.06 HARDWARE

- A. Sash lock: Lever handle with cam lock.
- B. Pulls: Manufacturer's standard type.

2.07 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41, clear anodic coating not less than 0.7 mil thick.
- B. Finish Color: Dark bronze.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining water-resistive barrier materials are ready to receive aluminum windows; see Section 07 2500.

3.02 PRIME WINDOW INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows in accordance with ASTM E2112.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Install sill and sill end angles.
- F. Set sill members and sill flashing in continuous bead of sealant.
- G. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Install operating hardware not pre-installed by manufacturer.

3.03 TOLERANCES

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

3.04 ADJUSTING

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

3.05 CLEANING

- A. Remove protective material from factory finished aluminum surfaces.
- B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.
- D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Automatic operators.
 - 4. Cylinders specified for doors in other sections.

C. REFERENCES

Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI A117.1 Accessible and Usable Buildings and Facilities.
- 2. ANSI/SDI A250.13 Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
- 3. ASTM E1886 Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.
- 4. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.
- 5. ASTM E1996 Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
- 6. ICC/IBC International Building Code.
- 7. NFPA 70 National Electrical Code.
- 8. NFPA 80 Fire Doors and Windows.
- 9. NFPA 101 Life Safety Code.
- 10. NFPA 105 Installation of Smoke Door Assemblies.
- 11. UL/ULC and CSA C22.2 Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
- 12. TAS-201-94 Impact Test Procedures.
- 13. TAS-202-94 Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
- 14. State Building Codes, Local Amendments.

- D. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards A156 Series
 - 2. UL10C Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
 - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

- a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
- b. Complete (risers, point-to-point) access control system block wiring diagrams.
- c. Wiring instructions for each electronic component scheduled herein.
- 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Qualification: Provide copy of manufacturer(s) Factory Trained Installer documentation indicating proof of status as a qualified installer of Windstorm assemblies.
- E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- F. Informational Submittals:
 - 1. Hurricane Resistant Openings: Within thus Virgin Island, provide copy of current State of Florida Product Approval or Metro-Dade County Notice of Acceptance (NOA) as proof of compliance that doors, frames and hardware for exterior opening assemblies have been tested and approved for use at the wind load and design pressure level requirements specified for the Project.
 - a. Hurricane Resistant Components: Within the US Virgin Island, provide copy of independent, third party certified listing to ANSI A250.13.
 - 2. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary

materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

- D. Door Hardware Standards and Guidelines: Prepare Door Hardware specification documents in accordance with the Owner's approved ASSA ABLOY Virtual Design Guide (VDG) standard for door opening products and applications.
- E. Building Information Modeling (BIM) Qualifications: BIM software tools and processes are used to produce and support data integration of product and technical information used in specifications, submittals, project reviews, decision support, and quality assurance during all phases of Project design, construction, and facility management. Door and hardware schedules and the associated product data parameters are to be derived, updated, and fully integrated with the coordinated BIM.
 - 1. Door Hardware BIM Software Tool: Openings Studio[™] is the designated BIM software suite to be used in a coordinated effort with architects, contractors and trades to integrate Project product data and information into the coordinated Record BIMs and associated applications..
- F. Windstorm Assembly Installer Qualifications: Installers are to be factory trained for shop and field installation prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project. A pre-installation site inspection of the frame and floor conditions shall be conducted by the factory trained installer prior to any Windstorm assembly hardware applied to the opening.
- G. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- H. Hurricane Resistant Exterior Openings including the High Velocity Hurricane Zone (HVHZ)): Provide exterior door hardware as complete and tested assemblies, or component assemblies, including approved doors and frames specified under Section 081113 "Hollow Metal Doors and Frames", to meet the wind loads, design pressures, debris impact resistance, and glass and glazing requirements as detailed in the Approval or Metro-Dade County Notice of Acceptance (NOA) sections applicable to the Project.
 - 1. Each unit to bear third party permanent label in accordance with the IBC requirements.
- I. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- J. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

- 1. Function of building, purpose of each area and degree of security required.
- 2. Plans for existing and future key system expansion.
- 3. Requirements for key control storage and software.
- 4. Installation of permanent keys, cylinder cores and software.
- 5. Address and requirements for delivery of keys.
- K. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- L. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.
- D. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Ten years for mortise locks and latches.
 - 2. Seven years for heavy duty cylindrical (bored) locks and latches.
 - 3. Five years for exit hardware.
 - 4. Twenty five years for manual surface door closer bodies.
 - 5. Five years for motorized electric latch retraction exit devices.
 - 6. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

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

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - 1. Permanent cylinders, cores, and keys to be installed by Conractor.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.

- b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
- 5. Manufacturers:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) TA Series.
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cutouts.
 - 1. Manufacturers:
 - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
- C. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 - 1. Manufacturers:
 - a. Markar Products; ASSA ABLOY Architectural Door Accessories (MR).
 - b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
- D. Pivots: ANSI/BHMA A156.4, Grade 1, certified. Space intermediate pivots equally not less than 25 inches on center apart or not more than 35 inches on center for doors over 121 inches high. Pivot hinges to have oil impregnated bronze bearing in the top pivot and a radial roller and thrust bearing in the bottom pivot with the bottom pivot designed to carry the full weight of the door. Pivots to be UL listed for windstorm where applicable.
 - 1. Manufacturers:
 - a. Rixson Door Controls (RF).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex[™] standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug

directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

- 1. Manufacturers:
 - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) EL-CEPT Series.
 - b. Von Duprin (VD) EPT-10 Series.
- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 - 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) Electrical Connecting Kit: QC-R001.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) Connector Hand Tool: QC-R003.
 - 2. Manufacturers:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) QC-C Series.

2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 - 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 - 2. Furnish dust proof strikes for bottom bolts.
 - 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 - 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - 5. Manufacturers:
 - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - b. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, holdopen lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 - 1. Manufacturers:

- a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- b. Trimco (TC).
- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
 - 1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 - 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 - 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 - 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 - 5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) year experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
- C. Cylinders: Original manufacturer cylinders complying with the following:
 - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 - 5. Keyway: Manufacturer's Standard.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 - 1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 - 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 - 3. New System: Key locks to a new key system as directed by the Owner.
- E. Key Quantity: Provide the following minimum number of keys:
 - 1. Change Keys per Cylinder: Two (2)
 - 2. Master Keys (per Master Key Level/Group): Five (5).
 - 3. Construction Keys (where required): Ten (10).

- F. Construction Keying: Provide construction master keyed cylinders.
- G. Key Registration List (Bitting List):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.
- H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
 - 1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).
- I. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into "Key Wizard" software.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
 - 1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) ML2000 Series.
 - b. Sargent Manufacturing (SA) 8200 Series.
 - c. Yale Locks and Hardware (YA) 8800FL Series.
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
 - 1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 - 2. Locks are to be non-handed and fully field reversible.
 - 3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 2 million cycles.
 - 4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) CL3300 Series.
 - b. Sargent Manufacturing (SA) 10 Line.

2.7 STAND ALONE ACCESS CONTROL LOCKING DEVICES

A. Stand Alone Electronic Keypad Locksets: Internal, battery-powered, self-contained ANSI Grade 1 mortise or cylindrical lock consisting of electronically motor driven locking mechanism and integrated keypad without requirements for separate electronic programming devices. Locks to accept standard, interchangeable (removable) core, security and high security override cylinders. Provide keypad locks with a minimum 100 user codes furnished standard with 6 "AA" batteries and non-volatile memory.

- 1. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
- 2. Manufacturers:
 - a. Sargent Manufacturing (SA) KP Series.

2.8 AUXILIARY LOCKS

- A. Push-Pull Latches, Mortise: ANSI/BHMA A156.13, Series 1000, Grade 1 mortise type push-pull locks and latches with paddle trim capable of being mounted as a standard product in vertical (up or down) and horizontal (sideways) positions. Locksets to be manufactured with a corrosion resistant, formed steel case and be non-handed and field reversible for re-handing without disassembly of the lock body. Paddles and covers are manufactured from cast stainless steel, brass or bronze material.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) 7800 PT Series.
- B. Push-Pull Latches, Paddle Type, Cylindrical: ANSI/BHMA A156.2, Series 4000, Operational Grade 1 hospital type push-pull latches with ligature-resistant paddle trim capable of being mounted vertically, horizontally, or in mixed combinations. Non-handed units, standard 2 3/4", 5", or 7" backsets available, and UL listed for all labeled metal or wood doors. Provide optional lead-lining and engraved cases or handles as specified in Hardware Sets.
 - 1. Manufacturers:
 - a. Corbin Russwin (RU) HP3000 Series.
 - b. Sargent Manufacturing (SA) HPU Series.

2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:

- 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
- 2. Strikes for Bored Locks and Latches: BHMA A156.2.
- 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
- 4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTROMAGNETIC LOCKING DEVICES

- A. Surface Electromagnetic Locks (Heavy Duty): Electromagnetic locks to be surface mounted type conforming to ANSI A156.23, Grade 2 with minimum holding force strength of 1,200 pounds. Locks to be capable of accepting between 12 to 24 volts direct current and be UL listed for use on fire rated door assemblies. Electromagnetic coils are to consume no more than 1.5W during normal operation. Locks are to have an integrated door position switch, tamper switch, and lock bond sensor. Locks are to have integrated motion sensor and/or security camera as indicated in the hardware sets. Locks to be capable of detecting door prop conditions and entering low power mode. Provide mounting accessories as needed to suit opening conditions. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.
 - 1. Manufacturers:
 - a. Securitron (SU) M680E Series.

2.11 ELECTRIC STRIKES

- A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike where specified.
 - 1. Manufacturers:
 - a. HES (HS).
- B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.
 - 1. Manufacturers:
 - a. HES (HS) 9400 Series
 - b. HES (HS) 9500/9600 Series.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
 - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 - 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 - 5. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
 - 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 - 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 - 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 - 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 - 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 - 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

- 12. Hurricane and Tornado Resistance Compliance: Conventional exit devices are to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) 80 Series.
 - b. Von Duprin (VD) 35A/98 XP Series.
- C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleableiron top and bottom retainers and a primed paint finish.
 - 1. Provide keyed removable feature where specified in the Hardware Sets.
 - 2. Provide stabilizers and mounting brackets as required.
 - 3. Provide electrical quick connection wiring options as specified in the hardware sets.
 - 4. Manufacturers:
 - a. Sargent Manufacturing (SA) 980S Series.
 - b. Von Duprin (VD) 9954 Series.

2.13 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
 - 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
 - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
 - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
 - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

- 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
- 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
 - 1. Manufacturers:
 - a. LCN Closers (LC) 4040 Series.
 - b. Sargent Manufacturing (SA) 351 Series.
- C. Door Closers, Overhead Concealed (Narrow Profile): ANSI/BHMA 156.4 certified Grade 1 door closers designed for narrow profile frames and doors. Closers to have fully concealed body in the frame head for offset hung applications, with separate and independent valves for closing speed and backcheck adjustments.
 - 1. Manufacturers:
 - a. LCN Closers (LC) 2030 Series.
 - b. Rixson Door Controls (RF) 91 Series.

2.14 ELECTROMECHANICAL DOOR OPERATORS

- A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.
 - 1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
- B. Standard: Certified ANSI/BHMA A156.19.
- C. Performance Requirements:
 - 1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
 - 2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.
- D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

- E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19.
- F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.
- G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.
- H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.
- I. Wifi Interface: Operator units shall have a wifi interface via a mobile device for ease of installation and setup.
- J. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Norton Door Controls (NO) 6300 Series.

2.15 SURFACE MOUNTED CLOSER HOLDERS

- A. Closer Holder Release Devices: ANSI A156.15 certified closer holder release devices designed to hold open fire or smoke rated doors until interruption of signal from fire alarm, smoke detector or remote release switch. Pull side, push side, or double egress mounting applications available with non-handed track and closer body and dual voltage input (24V/120V). Voltage to be 24VDC unless otherwise specified. Where optional detector is required, provide integral photo electric type with LED indicator. Auxiliary door stops are required at hold open point.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) -351 EHT(D) Series.
- B. Electromagnetic Door Holders: Certified ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.
 - 1. Manufacturers:
 - a. Rixson (RF) 980/990 Series.
 - b. Sargent Manufacturing (SA) 1560 Series.

2.16 ARCHITECTURAL TRIM

A. Door Protective Trim

- 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
- 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
- 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
- 4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
- 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
- 6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.17 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Manufacturers:

- a. Rixson Door Controls (RF).
- b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- c. Sargent Manufacturing (SA).

2.18 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Products; ASSA ABLÓY Architectural Door Accessories (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.19 ELECTRONIC ACCESSORIES

- A. Networked Contactless Smart Card Readers: Contactless smart cards reader to securely read access control data from 13.56 MHz contactless smart cards. The contactless smart card reader is designed for use in access control applications by providing:
 - 1. Secure access control data exchange between the smart card and the reader utilizing key diversification and mutual authentication routines.
 - 2. Contactless smart card reader to be designed for low current operation to enable migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Operating voltage: 5-16 VDC. Current requirements: 55 mA Avg, 116 mA Peak at 12 VDC.
- 3. Universal compatibility with most access control systems and backwards compatibility with legacy 125 KHz proximity access control formats.
- 4. Product construction suitable for both indoor and outdoor applications.
- 5. Customizable behavior for indicator lights and audible tones.
- 6. Manufacturers (13.56 MHz iClass):
 - a. HID Global (HD) R10/R40 Series.
- B. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.
 - 1. Manufacturers:
 - a. Alarm Controls (AK) MCK Series.
 - b. Securitron (SU) MK Series.
- C. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.
 - 1. Manufacturers:
 - a. Alarm Controls (AK) TS Series.
 - b. Securitron (SU) PB Series.

2.20 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.21 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch-Out Report): Reference Division 01 Section "Closeout Procedures". Final inspect installed door hardware and state in report whether work complies with or deviates from specification requirements, including whether door hardware is properly installed, operating and adjusted.
- B. Fire Door Assembly Inspection: Reference Division 01 Sections "Closeout Procedures" and "Cash Allowances" for testing and inspection allowances, including cost of engaging testing agencies, performing on-site inspections, and required documentation reporting.
 - 1. Allowance to perform the inspection and provide report documentation for an initial Fire Door Assembly Inspection upon completion of final hardware installation. A qualified fire door assembly (FDAI) inspector to certify swinging fire door openings are installed in accordance and NFPA 80 Standard for Fire Doors and Other Opening Protectives paragraph 5.2.4, regulatory compliance agencies, and local Authorities Having Jurisdiction (AHJ).
- C. Opening Tags: Affix readable, QR-type label to openings with password protected link-out to Openings Studio[™] BIM software suite and the installed door and hardware information.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Manufacturer's Abbreviations:
- 1. MK McKinney
- 2. OT OTHER
- 3. PE Pemko
- 4. MR Markar
- 5. RF Rixson
- 6. RO Rockwood
- 7. SA SARGENT
- 8. SU Securitron
- 9. SH Schlage Electronic Security
- 10. RI RITE Door
- 11. HS HES
- 12. BM Besam
- 13. NO Norton

Hardware Sets

Set: 01

Doors: 114, 115, 131T, Description: SGL - TOILETS

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Set	SG 28 10U65 LL	US26D	SA
1	Surface Closer	351 PA / REG	EN	SA
1	Door Stop	487	US26D	RO
3	Silencer	608		RO

<u>Set: 02</u>

Door: 113 Description: SGL - STAFFLOUNGE / BREAK - EAC-CR

3 Hinge	TA2714 4-1/2" x 4-1/2"	US26[) MK
1 Storeroom/Closet Lock	LC 28 10G04 LL	US26[D SA
1 Electric Strike	1006-LBM X 2005M3	630	hs 👍
1 Surface Closer	351 PA / REG	EN	SA
3 Silencer	608		RO
1 Door Position Switch	by Security Integrator		ОТ
1 Fire alarm relay	By security contractor		ОТ
1 HID Card Reader	by Security Integrator		ОТ
1 Power supply	by Security Contractor		ОТ

<u>Set: 03</u>

Doors: 116, 117 Description: SGL - IT , GROUND MAINTENACE

3 Hinge	TA2314 NRP 4-1/2" x 4- 1/2"	US32D	MK
1 Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA
1 Door Closer	351 P10	EN	SA
1 Door Stop	487	US26D	RO
1 Gasketing	S88D x LAR		ΡE

<u>Set: 04</u>

Doors: 133

Description: WALK-IN COOLER - MECH - ACOUSTIC

6	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Flush Bolt [COMBO]	2845 / 2945	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Mortise Exit Device, Storeroom	12 LC 8904 ETL	US32D	SA
1	Coordinator	2672 x Mounting Brkts as Req'd	Black	RO
2	Door Closer	351 PS	EN	SA
2	Armor Plate	K1050 36" X 2" LDW 4BE CSK	US32D	RO
1	Threshold	271A		ΡE
1	Gasketing	S88D x LAR		ΡE

2 Door Bottom	420APKL	PE
1 Edge gasket	357SP X S88D	PE

Notes: Confirm sound gasket requirements for STC45 rating

<u>Set: 05</u>

Doors: 132

Description: MEDICAL WASTE STORAGE AREA

1	Continuous Hinge	CFM83HD1		ΡE	
1	Continuous Hinge	CFM83HD1 PT		ΡE	
1	Flush Bolt [COMBO]	2845 / 2945	US26D	RO	
1	Dust Proof Strike	570	US26D	RO	
1	Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA	
1	Electric Strike	1006-LBM X 2005M3	630	HS	4
2	Door Operator	6031 verify mtg	689	NO	4
2	Armor Plate	K1050 36" X 2" LDW 4BE CSK	US32D	RO	
2	Door Stop	487	US26D	RO	
1	Electric Power Transfer	EL-CEPT		SU	4
2	Door Position Switch	by Security Integrator		ОТ	
1	Fire alarm relay	By security contractor		ОТ	
1	HID Card Reader	by Security Integrator		ОТ	
1	Wall actuator	506		NO	4
1	Power supply	by Security Contractor		ОТ	

<u>Set: 06</u>

Doors: 99B, 107A,109, 110, 121A, 123A, 124A, Description: EXT – FLAMABLES, DIETARY STORAGE, MEDICAL RECORDS, CORRIDOR, CENTAL STORAGE, LOADING DOCK CLEAN (NOA)

1	Continuous Hinge	CFM83HD1		ΡE	
1	Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA	
1	Electric Strike	1006-LBM X 2005M3	630	HS	4
1	Door Closer	351 CPS	EN	SA	
1	Threshold	2005AP		ΡE	
1	Gasketing	S88D x LAR		ΡE	
1	Rain Guard	346C		ΡE	
1	Sweep	3452APK		ΡE	
1	Door Position Switch	by Security Integrator		ОТ	
1	HID Card Reader	by Security Integrator		OT	
1	Power supply	by Security Contractor		ОТ	

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

<u>Set: 07</u>

Doors: 111, 112 Description: SGL – ELEC, FILE ROOM

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA
1	Concealed Overhead Stop	1-X36	630	RF
1	Surface Closer	351 PA / REG	EN	SA
3	Silencer	608		RO

<u>Set: 08</u>

Doors: 118, 119, 120 Description: SGL – JANITOR, STORAGE

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA
1	Surface Closer	351 PA / REG	EN	SA
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO
1	Door Stop	446 / 409 as required	US26D	RO
1	Gasketing	S88D x LAR		ΡE

<u>Set: 09</u>

Doors: 121C, 122, 124B, 123B Description: SGL - STOR - RATED

3	Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA
1	Door Closer	DA 351 Reg / PA	EN	SA
1	Armor Plate	K1050 36" X 2" LDW 4BE CSK	US32D	RO
1	Door Stop	487	US26D	RO

Set: 12

Flad Architects

Doors: 108 Description: MULTI-USE ROOM

6 Hinge	TA2714 4-1/2" x 4-1/2"	US26D MK
1 Flush Bolt [COMBO]	2845 / 2945	US26D RO

Set: 10

ΡE

Doors: 101, 102, 103, 104, 105, 106, 107C, 107D Description: SGL – COPY ROOM, OFFICE

1 Continuous Hinge	CFM83HD1	PE
1 Entry/Office Lock	LC SG 28 10G05 LL	US26D SA
1 Door Stop	446 / 409 as required	US26D RO
3 Silencer	608	RO

<u>Set: 11</u>

Doors: 99A, 130A Description: DOUBLE- RECEIVING AREA (NOA)

2	Continuous Hinge	CFM83HD1		PE
2	Surface Bolt	988	Bright Zinc	SA
1	Storeroom/Closet Lock	LC 28 10G04 LL	US26D	SA
1	Surface Closer	351 CPSH	EN	SA
1	Kick Plate	K1050 10" X 2" LDW 4BE CSK	US32D	RO
1	Threshold	2005AP		ΡE
1	Gasketing	S88D x LAR		ΡE
2	Sweep	3452APK		PE

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

12 LC 8904 ETL	US32D	SA
2672 x Mounting Brkts as Req'd	Black	RO
351 PS	EN	SA
K1050 36" X 2" LDW 4BE CSK	US32D	RO
271A		ΡE
S88D x LAR		ΡE
420APKL		ΡE
357SP X S88D		ΡE
	12 LC 8904 ETL 2672 x Mounting Brkts as Req'd 351 PS K1050 36" X 2" LDW 4BE CSK 271A S88D x LAR 420APKL 357SP X S88D	12 LC 8904 ETL US32D 2672 x Mounting Brktsas Black 351 PS EN X1050 36" X 2" LDW 4BE US32D 271A S88D x LAR 420APKL S88D 357 SP X S88D US32D

Notes: Confirm sound gasket requirements for STC45 rating

END OF SECTION

SECTION 08 7113 AUTOMATIC DOOR OPERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Operators for doors provided in other sections.
- B. Controllers, actuators and safety devices.
- C. Maintenance.

1.02 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- D. For automatic door terminology, see BHMA A156.10 and BHMA A156.19 for definitions of terms.

1.03 REFERENCE STANDARDS

- A. BHMA A156.10 Power Operated Pedestrian Doors.
- B. NEMA MG 1 Motors and Generators.
- C. NFPA 70 National Electrical Code.

1.04 SUBMITTALS

- A. Product Data: Provide data on system components, sizes, features, and finishes.
- B. Shop Drawings:
 - 1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
 - 2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
- C. Samples: Submit two samples of exposed to view hardware, carpet with frame, and attachment hardware.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and manufacturer's hardware and component templates.
- E. Maintenance Contract.
- F. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.

1.06 WARRANTY

- A. See Section 01 7800 Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Door Operators for Swing Doors Specified in Other Sections:
 - 1. Besam Entrance Solutions: www.besam.com.
 - 2. LCN, an Allegion, PLC Brand: www.allegion.com
 - 3. Horton Automatics: www.hortondoors.com

2.02 PERFORMANCE REQUIREMENTS

- A. Comply with BHMA A156.10 requirements.
- B. Opening Force:
 - 1. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails; not more than 15 lbf required to open door to minimum required width.
 - 2. Power-Operated Swinging Doors: Not more than 30 lbf required to manually open door if power fails.
 - 3. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for breakaway door or panel to open.
- C. Entrapment-Prevention Force: Not more than 40 lbf required to prevent stopped door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf required to prevent stopped door from moving in direction of closing.

2.03 OPERATORS FOR SWINGING DOORS

- A. Door Operator : Electric, surface mounted overhead.
 - 1. Operation: Full-power open, spring close operation.
 - 2. Variable speed control for opening and closing cycles.
 - 3. "Push" Side Actuator: Mat switch.
 - 4. "Pull" Side Actuator: Mat switch.
 - 5. Hold Open: Toggle switch at inside head of doors; deactivate hold-open on activation of fire alarm system.

2.04 CONTROLLERS, ACTUATORS, AND SAFETIES

- A. Controller: Provide microprocessor operated controller for each door.
- B. Comply with BHMA A156.10 for actuator and safety types and zones.
- C. Swinging Door Safety Device: Door-mounted proximity detector device arranged to prevent operation of door when persons or obstructions are in the swing zone.

2.05 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Electrical Characteristics: Coordinate selected product with Electrical Drawings.
- B. Motors: NEMA MG 1.
- C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- D. Disconnect Switch: Factory mount disconnect switch in control panel.

2.06 ACCESSORIES

A. Steel Clips, Supports, and Steel Anchors: Galvanized to 1.25 ounces per square foot.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available and is of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

- B. Provide for dimensional distortion of components during operation.
- C. Install pneumatic lines and door power units in manner to prevent condensation or freezing.
- D. Coordinate installation of components with related and adjacent work; level and plumb.

3.03 FIELD QUALITY CONTROL

- A. Certified Inspector: Engage a Certified Inspector to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

3.04 ADJUSTING

A. Adjust door equipment for correct function and smooth operation.

3.05 CLEANING

A. Remove temporary protection, clean exposed surfaces.

3.06 CLOSEOUT ACTIVITIES

A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.07 MAINTENANCE

- A. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion, at no extra charge to Owner.
 - 1. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Perform maintenance, including emergency callback service, during normal working hours.

END OF SECTION

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SECTION 08 8000 GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test.
- C. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- E. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1036 Standard Specification for Flat Glass.
- G. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
- I. ASTM C1193 Standard Guide for Use of Joint Sealants.
- J. ASTM C1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- K. ASTM E1300 Standard Practice for Determining Load Resistance of Glass in Buildings.
- L. ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
- M. GANA (SM) GANA Sealant Manual.
- N. NFRC 100 Procedure for Determining Fenestration Product U-factors.
- O. NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- P. NFRC 300 Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.04 SUBMITTALS

- A. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- C. Samples: Submit two samples 12 by 12 inch in size of glass units.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (LGRM), GANA (SM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years experience and approved by manufacturer.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 7700 Closeout Procedures for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 4. Saint Gobain North America: www.saint-gobain.com/#sle.
 - 5. Vitro Architectural Glass/PPG: www.vitroglazing.com.
- B. Laminated Glass Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 2. Tecnoglass; Laminated Glass: www.tecnoglass.com/#sle.
 - 3. Thompson I.G., LLC; Laminated Glass: www.thompsonig.com/#sle.
 - 4. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

- A. Select type and thickness of glazing assemblies to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with ASCE 7.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - a. Maximum Lateral Deflection:
 - 1) For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 3. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7.
 - 4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 5. Glass thicknesses listed are minimum.
- B. Wind-Borne-Debris-Resistance: Indentical full sized glazed assembly without auxillary protection having Miami-Dade County approval for Large and Small Missle Impact and pressure cycling at design wind pressure.

- C. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
- D. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.
- E. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.03 GLASS MATERIALS

- A. GL1 Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I Transparent Flat, Class 1 Clear, Quality Q3.
 - 2. Kind FT Fully Tempered Type: Complies with ASTM C1048.
 - 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 - 4. Impact Resistant Safety Glass: Complies with ANSI Z97.1 Class B, or 16 CFR 1201 Category I criteria.
 - 5. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Complies with ANSI Z97.1 Class B or 16 CFR 1201 Category I impact test requirements.
 - 2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
 - 1. Glass: Any of the manufacturers specified for float glass.
 - 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc: www.pilkington.com/na/#sle.Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 4. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
- B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- C. Insulating Glass Units: Types as indicated.
 - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 - 3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
 - 4. Spacer Color: Black.
 - 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - 6. Color: Black.
 - 7. Purge interpane space with dry air, hermetically sealed.
- D. Type IG1 Insulating Glass Units: Vision glass, double glazed.
 - 1. Applications: Exterior glazing unless otherwise indicated.
 - 2. Space between lites filled with argon.

- 3. Outboard Lite: Laminated, 1/2 inch thick, minimum.
 - a. Outer Lite: Annealed float glass, 1/4 inch thick, minimum.
 - b. Middle Lite: Annealed float glass, 1/4 inch thick, minimum.
 - c. Tint: Clear.
 - d. Interlayer: Polyvinyl butyral (PVB); thickness as required.
 - e. Coating: Low-E (solar control type), on #2 surface.
- 4. Metal edge spacer.
- 5. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum. a. Tint: Clear.
- 6. Total Thickness: 1 1/4 inch.
- 7. Thermal Transmittance (U-Value), Summer Center of Glass: 0.25, nominal.
- 8. Glazing Method: Dry glazing method, gasket glazing.

2.05 GLAZING UNITS

- A. Type G-2 Monolithic Interior Vision Glazing:
 - 1. Tint: Clear.
 - 2. Thickness: 1/4 inch, nominal.
 - 3. Glazing Method: Dry glazing method, gasket glazing.
- B. Type G-6 Hurricane Impact Resistance Glazing: Laminated glass, 3-Ply.
 - 1. Tint: Clear.
 - 2. Thickness: As required to meet performance criteria.
 - 3. Outside Lite: Annealed glass.
 - 4. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 5. Middle Lite: Annealed glass.
 - 6. Interlayer, Inboard Side: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 7. Inside Lite: Tempered glass.

2.06 GLAZING COMPOUNDS

A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.07 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Verify that sealing between joints of glass framing members has been completed effectively.
- D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

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SECTION 08 8813 FIRE-RESISTANT GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-protection-rated glazing.

1.02 DEFINITIONS

- A. Fire Protection Rated Glazing: Glazing tested for use in a fire door assembly or fire window and is limited to such use.
- B. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- C. Glass Thicknesses: Indicated by thickness designations in millimeters per ASTM C1036.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
- B. AAMA 800 Voluntary Specifications and Test Methods for Sealants.
- C. ASTM C1036 Standard Specification for Flat Glass.
- D. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- E. ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
- F. ASTM C1281 Standard Specification for Preformed Tape Sealants for Glazing Applications.
- G. ASTM C1330 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- H. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
- I. GANA (LGRM) Laminated Glazing Reference Manual.
- J. GANA (GM) GANA Glazing Manual.
- K. NFPA 257 Standard on Fire Test for Window and Glass Block Assemblies.
- L. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
- M. UL 9 Standard for Fire Tests of Window Assemblies.

1.04 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.05 SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product; 12 inches square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.06 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.

1.07 DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.08 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient

temperature conditions at occupancy levels during the remainder of the construction period.

1.09 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.02 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.03 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 1. GANA Publications: GANA (LGRM) Glazing Reference Manual" and GANA (GM).
- B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council, other certification agency acceptable to authorities having jurisdiction, or manufacturer. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.04 GLASS PRODUCTS

- A. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- B. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fireresistance rating is based on another product.
 - 2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.

2.05 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
- B. Laminated Ceramic Glazing: Laminated glass made from two plies of clear, ceramic glass; 8mm total thickness; and complying with 16 CFR 1201, Category II.
 - 1. Products:
 - a. Technical Glass Products; FireLite Plus.

- b. Schott North America, Inc.; Pyran Platinum L.
- c. Vetrotech Saint-Gobain; Keralite Laminated.

2.06 GLAZING ACCESSORIES

- A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.
- B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.
 - 1. Sealants shall have a VOC content of 250 g/L or less.
 - 2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

2.07 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.08 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.03 GLAZING

- A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.
- B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.04 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Remove and replace glass damaged during construction.
- D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 08 9100 LOUVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.02 REFERENCE STANDARDS

- A. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- B. AMCA 511 Certified Ratings Program Product Rating Manual for Air Control Devices.
- C. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- D. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- E. Miami (APD) Approved Products Directory; Miami-Dade County.

1.03 SUBMITTALS

- A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- B. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
- C. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
- D. Reports: Indicating compliance of louvers, having Florida Building Code approval.
- E. Test Reports: Independent agency reports showing compliance with specified performance criteria.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Maintenance Data: Include lubrication schedules, adjustment requirements.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum five years of experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.05 WARRANTY

- A. Provide one year manufacturer warranty against distortion, metal degradation, and failure of connections.
- B. Provide twenty year manufacturer warranty against degradation of exterior finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Ruskin Dampers and Louvers; EME562MDE: www.ruskin.com.

2.02 LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
 - 1. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.

- 2. Wind-Borne-Debris Resistance: Identical full-size assembly having Miami (APD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
- 3. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
- B. Stationary Louvers: Horizontal blade, extruded aluminum construction, with intermediate mullions matching frame.
 - 1. Free Area: 55 percent, minimum.
 - 2. Blades: Drainable.
 - 3. Frame: 5 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
 - 4. Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.
 - 5. Aluminum Finish: As selected by Architect from manufacturers full range; finish welded units after fabrication.

2.03 BLANK-OFF PANELS

A. Uninsulated, Blank-Off Panels: Metal sheet attached to back of louver.
1. Aluminum sheet, not less than 0.050-inch minimum.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.05 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

2.06 ACCESSORIES

- A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- C. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.
- B. Verify that field measurements are as indicated.

3.02 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Coordinate with installation of flashings by others.
- C. Install louvers level and plumb.
- D. Set sill members and sill flashing in continuous bead of sealant.
- E. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- F. Secure louver frames in openings with concealed fasteners.

3.03 ADJUSTING

A. Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

3.04 CLEANING

- A. Strip protective finish coverings.
- B. Clean surfaces and components.

END OF SECTION

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SECTION 09 2216 NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.02 REFERENCE STANDARDS

- A. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- B. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C645 Standard Specification for Nonstructural Steel Framing Members.
- D. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- E. ASTM C841 Standard Specification for Installation of Interior Lathing and Furring.
- F. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- G. ASTM E413 Classification for Rating Sound Insulation.
- H. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- I. ICC-ES AC86 Acceptance Criteria for Cold-Formed Steel Framing Members Interior Nonload-bearing Wall Assemblies.

1.03 SUBMITTALS

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, stud limiting height charts, and limitations.
- B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Shop Drawings:
 - 1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.
 - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Evaluation Reports: Submit evaluation reports certified under an independent third party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Deflection Criteria: Maximum deflection of wall framing of L/240 at 5 psf.
- B. Limiting Height Criteria: Conform to ICC-ES AC86 and ASTM C754.
- C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate nonload-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, per ASTM E119 by an independent testing agency.
- D. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, per ASTM E90 and classified per ASTM E413 by an independent testing agency.

2.02 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: ASTM C645, unless otherwise indicated.
 - 2. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Loadbearing Studs: As specified in Section 05 4000.
- C. Non-Loadbearing Studs and Runners: ASTM C645. Use either standard steel studs and runners or high strength steel studs and runners.
 - 1. Standard Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 30 mil.
 - b. Depth: 3-5/8 inches, unless indicated otherwise on Drawings.
 - 2. High Strength Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 18 mil.
 - b. Depth: 3-5/8 inches, unless indicated otherwise on Drawings.
 - c. Products:
 - 1) ClarkDietrich Building Systems; ProStud 20: www.clarkdietrich.com.
 - 2) Marino/Ware; Viper 20: www.marinoware.com
 - d. Members that can show certified third party testing with gypsum board in accordance with ICC-ES AC86 need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C645. The submission of a recognized evaluation report is acceptable to show conformance to this requirement.
- D. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C645 top runner with 2 inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - 2. 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.
 - 3. 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:
 - 1) ClarkDietrich Building Systems; MaxTRAK Slotted Deflection Track: www.clarkdietrich.com
 - 2) Marino/Ware; Slotted Track: www.marinoware.com
 - 3) MBA Building Supplies; FlatSteel Deflection Track: www.mbastuds.com
 - 4) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series: www.steelnetwork.com.
 - 5) Superior Metal Trim; Superior Flex Track System (SFT).
 - 6) Telling Industries; Vertical Slip Track: www.buildstrong.com.
- E. Firestop Tracks:
 - 1. Top Runner Track: 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.
 - a. Products:
 - 1) ClarkDietrich Building Systems; BlazeFrame Fire Stop Deflection Track DSL2: www.clarkdietrich.com.
 - 2) Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip: firetrak.com.
 - 3) Marino/Ware; FAS Track 1000 Slotted: www.marinoware.com.
 - 4) Metal-Lite, Inc.; The System: www.metal-lite.net.

- 2. Bottom Tracks: Manufactured to maintain continuity of fire-resistance-rated assembly indicated at floor level; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products:
 - 1) ClarkDietrich Building Systems; Blaze Frame PS36 BW/BWE profile; PS50-DLJ Series Bottom of Wall: www.clarkdietrich.com.
 - 2) Safti-Seal Inc.; SaftiFrame PS36: www.saftiseal.com
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.33 inch.
- G. Wood Backing Plate Assembly: Manufacturer's proprietary flexible wood backing assembly for blocking in metal stud wall systems consisting of fire retardant plywood backer panels connected by metal hinge. System flexes around stud and snaps into place.
 - 1. Products:
 - a. ClarkDietrich Building Systems; Danback: www.clarkdietrich.com.
 - b. Trim-Tex; Backerboard: www.trim-tex.com.
- H. Fire-Rated Control Joint: For fire-rated walls and partitions; Metal profile with intumescent material located on backside spanning gap between opposing drywall edge at control joint locations. Joint opening protected by orange tape, to be removed after finishing.
 - 1. Products:
 - a. ClarkDietrich Building Systems; FAS-093X Fire-Rated Control Joint: www.clarkdietrich.com.
 - b. Marino/Ware; FAS-093X Fire-Rated Control Joint: www.marinoware.com.
 - 2. Size: 0.013 inch thick x 2 inches wide.
- I. Control Joint Backer: For fire-rated walls and partitions; Metal profile which supports intumescent materials located inside and spanning gap between opposing drywall edge at control joint locations.
 - 1. Products:
 - a. Safti-Seal inc.: Safti Frame Control Joint Backer (CJB): ww.saftiseal.com.
 - 2. Size: 18 mils thick x 3-1/4 inch wide.
- J. Flat Strap Backer: For fire rated walls and partitions at reveals; Metal strap with intumescent material located behind joints in gypsum board where reveal molding is installed.
 - 1. Product:
 - a. Blazeframe Industries; Flat Backer Strap (FSB): www.blazeframe.com.
 - b. ClarkDietrich Building Systems; Flat Backer Strap (FSB): www.clarkdietrich.com.
 - c. Safti-Seal inc.: Flat Strap Backer (FSB): ww.saftiseal.com.
 - 2. Size: 30 mils thick x 3 inches wide.
- K. Header/Sill System: Preformed, pre-engineered header/sill, minimum 33 mils, galvanized sheet steel for use at openings in metal stud wall systems.
 - 1. Products:
 - a. Cemco; Pro X Header: www.cemcosteel.com.
- L. Bridging / Bracing Bar: Engineered, pre-notched, 33 mils, galvanized sheet steel spacer bar for interior metal stud walls.
 - 1. Products:
 - a. ClarkDietrich Building Systems; Spazzer Bar: www.clarkdietrich.com.
 - b. Simpson Strong-Tie; DBR Spacer Bracer: www.strongtie.com
 - c. Steel Network, Inc.; Bridge Bar: www.steelnetwork.com.
- M. Cold-Rolled Channel Bridging: Steel, 0.053 inch minimum base-metal thickness, with minimum 1/2 inch wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068 inch thick, galvanized steel.
- N. Hat-Shaped, Rigid Furring Channels: ASTM C645.

- 1. Minimum Base-Metal Thickness: As indicated on Drawings.
- 2. Depth: As indicated on Drawings.
- O. Cold-Rolled Furring Channels: 0.053 inch uncoated-steel thickness, with minimum 1/2 inch wide flanges.
 - 1. Depth: As indicated on Drawings.
 - 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoatedsteel thickness of 0.33 inch.
 - 3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062 inch diameter wire, or double strand of 0.048 inch diameter wire.

2.03 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.

PART 3 EXECUTION

3.01 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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.

3.03 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Plaster Assemblies: Also comply with ASTM C841.
- 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.

3.04 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. 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 or pre-engineered header/sill (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud.
 - 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.
 - 6. Curved Partitions:
 - a. Use proprietary track.
 - b. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - c. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 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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SECTION 09 2900 GYPSUM BOARD

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior gypsum board.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- C. ASTM C1047 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- D. ASTM C1396/C1396M Standard Specification for Gypsum Board.
- E. ASTM C1629/C1629M Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- F. ASTM C1658/C1658M Standard Specification for Glass Mat Gypsum Panels.
- G. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- H. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board.
- I. ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications.
- J. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- K. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- L. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- M. ASTM E413 Classification for Rating Sound Insulation.
- N. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size sample in 12 inch long length for each trim accessory indicated.
 - 2. Acoustical Wall Shielding: Two samples 12 by 12 inch in size.

1.04 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.

1.05 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. 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

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated per 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 per ASTM E90 and classified per ASTM E413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 INTERIOR GYPSUM BOARD

- A. Manufacturers:
 - 1. CertainTeed Corp.: www.certainteed.com.
 - 2. Continental Building Products: www,continental-bp.com.
 - 3. Georgia-Pacific Gypsum LLC: www.gp.com.
 - 4. National Gypsum Company: www.nationalgypsum.com.
 - 5. USG Corporation: www.usg.com.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Moisture- and Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Products:
 - 2. Core: 5/8 inch, Type X.
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: Score of 10, when tested per ASTM D3273.
- D. Impact Resistant Gypsum Wallboard:
 - 1. Application: High-traffic areas indicated.
 - 2. Surface Abrasion: Level 3, minimum, when tested per ASTM C1629/C1629M.
 - 3. Indentation: Level 1, minimum, when tested per ASTM C1629/C1629M.
 - 4. Soft Body Impact: Level 3, minimum, when tested per ASTM C1629/C1629M.
 - 5. Hard Body Impact: Level 2, minimum, when tested ASTM C1629/C1629M.
 - 6. Mold Resistance: Score of 10, when tested per ASTM D3273.
 - 7. Glass Mat-Faced Type: Gypsum wallboard as defined in ASTM C1658/C1658M.
 - 8. Type: Fire resistance rated Type X, UL or WH listed.
 - 9. Thickness: 5/8 inch.
 - 10. Edges: Tapered.
 - 11. Products:
 - a. Georgia-Pacific Gypsum; DensArmor Plus Impact-Resistant Panel.
 - b. National Gypsum Company; Gold Bond eXP Interior Extreme IR Gypsum Panel.
 - c. USG Corporation; Glass Mat Mold Tough VHI Firecode X Panels.

2.04 SPECIALTY GYPSUM BOARD

A. Acoustical Sound Dampening Wall and Ceiling Board: Two layers of heavy paper faced, high density gypsum board separated by a viscoelastic polymer layer and capable of achieving STC rating of 50 or more in typical stud wall assemblies as calculated in accordance with ASTM

Project No. 23245-00 Gypsum Board Section 09 2900 - 2 E413 and when tested in accordance with ASTM E90.

- 1. Thickness: 5/8 inch.
- 2. Long Edges: Tapered.
- 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- 4. Products:
 - a. CertainTeed Corporation; SilentFX Quick Cut Gypsum Board.
 - b. CertainTeed Corporation; SilentFX Quick Cut Type X Gypsum Board.
 - c. PABCO Gypsum; Quiet Rock: www.pabcogypsum.com.

2.05 SOUND DAMPENING COMPOUND

A. Sound Dampening Compound: Green Glue Co.; Noiseproofing Compound: www.greengluecompany.com.

2.06 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum coated sheet steel or plastic.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.
 - d. Curved-Edge Cornerbead: With notched or flexible flanges.

2.07 PARTITION CLOSURES

- A. Provide extruded aluminum adjustable partition closures at all junctures of partitions with other construction as indicated.
- B. Adjustable Partition Closures: Pre-assembled, STC rating of 50 minimum, except where indicated higher, with finish to match mullion as determined by Architect.
- C. Manufacturer:
 - 1. Gordon Inc.; Mullion Mate: www.gordon-inc.com.
 - a. Series 40 Plus.
 - b. Sizes: Mullion Mate 5 5 inch minimum to 6-15/16 inch maximum opening.

2.08 PARTITION END CAPS

- A. Provide extruded aluminum partition end caps at all partition termination ends.
- B. Provide at locations of all adjustable partition closures and other locations indicated. Finish to match curtain wall system.
- C. Manufacturers:
 - 1. Gordon Inc.; Series 910 Special Shapes End Cap.

2.09 JOINT TREATMENT MATERIALS

- A. Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper or Paperless.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use settingtype taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting type, sandable topping compound.
2.10 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 inch to 0.112 inch thick.
- D. Sound Attenuation Blankets: Refer to Section 07 2100 Thermal Insulation.
- E. Acoustical Joint Sealant: Refer to Section 07 9219 Acoustical Joint Sealant.
- F. Thermal Insulation: Refer to Section 07 2100 Thermal Insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, 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.

3.02 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 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 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.
- I. STC-Rated Assemblies: 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 for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: As indicated on Drawings.
 - 2. Flexible Type:As indicated on Drawings.
 - 3. Impact-Resistant Type: As indicated on Drawings.
 - 4. 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) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one 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. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.04 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 per ASTM C840.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated on Drawings.

3.05 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, beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 3: Where indicated on Drawings.
 - 3. Level 4: At surfaces exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 09 9123 Interior Painting.
 - 4. Level 5: Where indicated on Drawings.

a. Primer and its application to surfaces are specified in Section 09 9123 - Interior Painting.

3.06 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. 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.

SECTION 09 5100 ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 REFERENCE STANDARDS

- A. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM C635/C635M Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- C. ASTM C636/C636M Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- D. ASTM E580/E580M Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- E. ASTM E1264 Standard Classification for Acoustical Ceiling Products.

1.03 SUBMITTALS

- A. Shop Drawings: Indicate grid layout and related dimensioning.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two full size samples illustrating material and finish of acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

1.04 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years experience.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
 - 1. Local authorities having jurisdiction.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units General: ASTM E1264, Class A.
- B. Acoustical Panels, Type APC1: Mineral fiber with membrane-faced overlay, with the following characteristics:
 - 1. Classification: ASTM E1264 Type IV.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 3/4 inch.
 - 4. Light Reflectance: 0.88 percent, determined in accordance with ASTM E1264.
 - 5. NRC Range: 0.80 determined in accordance with ASTM E1264.
 - 6. Ceiling Attenuation Class (CAC): 40, determined in accordance with ASTM E1264.
 - 7. Panel Edge: Square.
 - 8. Color: White.

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- 9. Suspension System Type GD1: Exposed grid.
- 10. Products:
 - a. Armstrong World Industries, Inc; Calla: www.armstrongceilings.com/#sle.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
- D. Gypsum Board: Fire rated type; 5/8 inch thick, ends and edges square, paper faced.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch clearance between grid ends and wall.
- F. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
- G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- J. Do not eccentrically load system or induce rotation of runners.

K. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:1. Make field cut edges of same profile as factory edges.
- F. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- A. Clean surfaces.
- B. Replace damaged or abraded components.

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SECTION 09 6513 RESILIENT BASE AND ACCESSORIES

ART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient base.
- B. Resilient molding accessories.

1.02 REFERENCE STANDARDS

- A. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- B. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- C. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- D. ASTM F1861 Standard Specification for Resilient Wall Base.

1.03 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Shop Drawings: Indicate seaming plan.
- C. Verification Samples: Submit two samples, six inch long illustrating color and pattern for each resilient base and accessory product specified.
- D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect roll materials from damage by storing on end.

1.05 FIELD CONDITIONS

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 RESILIENT BASE

- A. Manufacturers:
 - 1. Burke Flooring Products, Division of Burke Industries Inc.: www.burkeflooring.com.
 - 2. Flexco: www.flexcofloors.com.
 - 3. Tarkett: www.commercial.tarkett.com.
 - 4. Roppe Corporation, USA: www.roppe.com.
- B. RB1 Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove, Style A, Straigth and as follows:
 - 1. Height: 4 inch.
 - 2. Thickness: 0.125 inch thick.
 - 3. Product: Duracove.
 - 4. Finish: Satin.
 - 5. Length: Roll.
 - 6. Colors: 6510 Dinner Rolls
 - 7. Accessories: Premolded end stops.

2.02 MOLDING ACCESSORIES

- A. Moldings, Transition and Edge Strips: Same material as flooring.
 - 1. Nosing for resilient flooring.

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- 2. Reducer strip for resilient flooring.
- 3. Transition strips.
- B. Manufacturers:
 - 1. Armstrong Flooring, Inc.: www.armstrongflooring.com.
 - 2. Tarkett: www.commercial.tarkett.com.
- C. Profile and Dimensions: As indicated on Drawings.
- D. Colors and Patterns: As selected by Architect from manufacturer's full color range.

2.03 ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Concrete Substrates: Test per 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 flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient base manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient base manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 6 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test per ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate in 24 hours as recommended by flooring manufacturer
 - b. Perform relative humidity test using in situ probes per ASTM F2170. Proceed with installation only after substrates have a maximum percent relative humidity level as recommended by the flooring manufacturer.
 - c. Provide one test for every 1000 square feet of floor slab.
 - d. Refer to Section 09 6105 Water Vapor Emission Control System, if concrete substrate fails moisture testing.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- D. Prohibit traffic until filler is cured.
- E. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

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3.03 RESILIENT BASE

- A. Comply with manufacturer's 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. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- D. Miter internal corners.
- E. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- F. Install base on solid backing. Bond tightly to wall and floor surfaces.
- G. Scribe and fit to door frames and other interruptions.

3.04 MOLDING ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.05 CLEANING

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

3.06 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

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SECTION 09 6516.33 RUBBER SHEET FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rubber sheet flooring.

1.02 REFERENCE STANDARDS

- A. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- B. ASTM F1516 Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
- C. ASTM F1859 Standard Specification for Rubber Sheet Floor Covering Without Backing.
- D. ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- F. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- G. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 1. Show details of special patterns.
- C. Samples: For each exposed product and for each color and pattern specified in manufacturer's
- standard size, but not less than 6 inch by 9 inch sections.
- D. Heat-Welded Seam Samples: For each rubber sheet flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6 inch by 9 inch Sample applied to rigid backing, prepared by Installer for this Project.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- G. Product Schedule: For rubber sheet flooring. Use same designations as indicated on Drawings.
- H. Qualification Data: For Installer.
- I. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of experience.
- B. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degF or more than 90 degF. Store rolls upright.

1.06 FIELD CONDITIONS

A. Maintain temperature in storage area not less than 70 degF or more than 85 degF, and in spaces to receive flooring during the following time periods:

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- 1. 48 hours before installation.
- 2. During installation.
- 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain temperature not less than 55 degF or more than 95 degF.
- C. Close spaces to traffic during flooring installation.
- D. Close spaces to traffic for 72 hours after flooring installation.
- E. Install flooring after other finishing operations, including painting, have been completed.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, 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.

2.02 RUBBER SHEET FLOORING

- A. Products:
 - 1. Flexco Inc.: www.flexcofloors.com
 - 2. Gerflor: www.gerflorusa.com.
 - 3. Johnsonite, Inc., a Tarkett company: www.johnsonite.com.
 - 4. Nora Systems, Inc.: www.nora.com.
 - 5. PRF USA, Inc.
 - 6. R.C.A. Rubber Company (The): www.rcarubber.com.
 - 7. VPI Corporation, Floor Products Division: www.vpicorp.com.
- B. Minimum Requirements: ASTM F1859.
 - 1. Type: Type I (homogeneous rubber sheet).
 - 2. Thickness: 0.125 inch.
- C. Wearing Surface: Smooth.
- D. Sheet Width: As standard with the manufacturer.
- E. Seamless-Installation Method: Heat welded.
- F. Colors and Patterns: As selected by Architect from manufacturer's full color range.

2.03 ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Primers and Adhesives: Water-resistant type recommended by flooring manufacturer's to suit floor tile and substrate conditions indicated.
- C. Primers and Adhesives: Two-part high performance adhesive for heavy loads and rolling loads, recommended by manufacturer.
- D. Seamless-Installation Accessories:
 - Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 a. Color: As selected by Architect from manufacturer's full color range.
 - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Concrete Substrates: Test in per 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 flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum flooring manufacturer. Do not use solvents.
- 3. Alkalinity and Adhesion Testing: Perform tests recommended by rubber sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 6 or more than 9 pH.
- 4. Moisture Testing: Proceed with installation only after substrates pass testing according to rubber sheet flooring manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test per ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate in 24 hours as recommended by flooring manufacturer
 - b. Perform relative humidity test using in situ probes per ASTM F2170. Proceed with installation only after substrates have a maximum percent relative humidity level as recommended by the flooring manufacturer.
 - c. Provide one test for every 1,000 square feet of floor slab.
 - d. Refer to Section 09 6105 Water Vapor Emission Control System, if concrete substrate fails moisture testing.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with leveling and patching compound to achieve smooth, flat, hard surface.
- C. Prohibit traffic until leveling and patching compound is cured.
- D. Do not install flooring until it is the same temperature as space where it is to be installed.
 - 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.03 RUBBER SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing sheet flooring.
- B. Unroll rubber sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out rubber sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 - 3. Match edges of flooring for color shading at seams.
 - 4. Avoid cross seams.
- D. Scribe and cut sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- H. Install sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

- I. Adhere sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- J. Seamless Installation:
 - 1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
- K. Integral-Flash-Cove Base: Cove flooring up vertical surfaces 6 inches up. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
 1. Install metal corners at inside and outside corners.

3.04 CLEANING AND PROTECTION

- A. Comply with manufacturer's instructions for cleaning and protecting sheet flooring.
- B. Perform the following operations immediately after completing sheet flooring 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 sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover sheet flooring until Substantial Completion.

SECTION 09 7800 INTERIOR WALL PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Decorative plastic wall paneling.
- B. Accessories.

1.02 REFERENCE STANDARDS

- A. ASTM D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D570 Standard Test Method for Water Absorption of Plastics.
- C. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- D. ASTM D5319 Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
- E. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ISO 846 Plastics Evaluation of the Action of Microorganisms.
- G. ISO 2812-1 Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature for each specified product. Include anchorage devices specific to project substrate types.
- B. Shop Drawings: Submit elevations for each application and location. Indicate details of joints and attachments.
- C. Samples: Submit two samples 12 by 12 inches in size, indicating finish, surface design, and color for each type of panels.
- D. Certificates: Certify that products of this section meet or exceed specified requirements.
- E. Manufacturer's Instructions: Provide manufacturer's installation instructions.
- F. Manufacturer's qualification statement.
- G. Maintenance Data: Include recommended instructions, methods, and materials for cleaning glass, aluminum framing, and FRP panels.
- H. Warranty Documentation: Manufacturer warranty; ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Specimen Warranty: Manufacturer warranty.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in manufacturer's original packaging, marked with manufacturer's product identification.
- B. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.06 WARRANTY

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

B. Extended Correction Period: Correct defective work within a 5-year period for failure of materials or workmanship commencing on the Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Decorative Plastic Wall Paneling:
 - 1. Crane Composites, Inc: www.cranecomposites.com/#sle.
 - 2. Marlite, Inc: www.marlite.com/#sle.
 - 3. Nudo Products, Inc; FiberLite FRP: www.nudo.com/#sle.
 - 4. Panolam Surface Systems: www.panolam.com/#sle.
 - 5. MDC Interior Solutions; Dimension Walls: www.mdcwall.com/#sle.

2.02 REGULATORY REQUIREMENTS

A. Surface Burning Classification: Provide wall paneling assemblies meeting Class A when tested in accordance with ASTM E84.

2.03 DECORATIVE PLASTIC WALL PANELING

- A. Decorative Plastic Wall Paneling: Digitally-printed pattern images with manufacturer's standard scratch-resistant, UV-resistant protective coating.
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: 0.075 inch.
 - 3. Material: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - a. Impact Strength: Greater than 6 ft lbf/in, when tested in accordance with ASTM D256.
 - b. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - c. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
 - d. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.
 - e. Water Absorption: 0.2 percent, maximum, when tested in accordance with ASTM D570.
 - 4. Edges: Square.
- B. Accessories:
 - 1. Trim:
 - a. Material: Vinyl.
 - b. Color/Finish: [____
 - c. Divider Bars: Manufacturer's standard, matching and aligning with design pattern.
 - d. Inside Corner Trim: Standard angle.
 - e. Outside Corner Trim: Standard angle.
 - f. Edge Trim: Manufacturer's standard shape.
 - 2. Adhesive: Type recommended by panel manufacturer.
 - 3. Sealant: Type recommended by paneling manufacturer; clear.

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PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer.
 - 2. Comply with adhesive manufacturer's recommendations for remedial measures at locations and application conditions where adhesion test results are unsatisfactory.
- C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install panels in accordance with manufacturer's instructions.

- B. Apply adhesive to back side of panel using trowel recommended by adhesive manufacturer.
- C. Apply panels to wall with vertical joints plumb and horizontal joints level and pattern aligned with adjoining panels.
- D. Using a roller, apply pressure to panel face to ensure proper adhesion between surfaces.
- E. Install panels with manufacturer's recommended gaps for panel field and corner joints.
- F. Install trim with adhesive.
- G. Seal joints at wall base and between panels with approved sealant to prevent moisture intrusion.
- H. Remove excess sealant after paneling is installed and prior to curing.

3.03 ADJUSTING

A. Replace paneling installed out of plumb and/or not aligned with adjacent panels or construction.

3.04 CLEANING

A. Clean panel faces using cleaning agents and methods recommended by manufacturer to remove soiling.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals for closeout submittals.

3.06 PROTECTION

A. Protect installed interior wall paneling from subsequent construction operations.

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SECTION 09 9113 EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and the application of paint systems on exterior substrates.

1.02 REFERENCE STANDARDS

- A. ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. ASTM D523 Standard Test Method for Specular Gloss.
- C. MPI (APSM) Master Painters Institute Architectural Painting Specification Manual.
- D. SSPC-PA 1 Shop, Field, and Maintenance Coating of Metals.
- E. SSPC-SP 3 Power Tool Cleaning.

1.03 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D16 apply to this Section.
- B. Sheen: As defined by MPI (APSM).
 - 1. Wherever reference is made to sheen finish or gloss, provide reflectivity, when measured with a gloss meter per ASTM D523, as follows for each designation:
 - a. Gloss Level 1: Flat: Not more than 10 units, at a 85 degree meter.
 - b. Gloss Level 3: Eggshell: Not less than 10 units, nor more than 25 units, at a 60 degree meter.
 - c. Gloss Level 4: Satin: Not less than 20 units, nor more than 35 units, at a 60 degree meter.
 - d. Gloss Level 5: Semi-Gloss: Not less than 35 units, nor more than 70 units, at a 60 degree meter.
 - e. Gloss Level 6: Full Gloss: Not less than 70 units, nor more than 85 units, at a 60 degree meter.
 - f. Gloss Level 7: High Gloss: More than 85 units at a 60 degree meter.

1.04 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
- C. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. 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. VOC content.

1.05 DELIVERY, STORAGE, AND HANDLING

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

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Benjamin Moore & Co.; www.benjaminmoore.com.
- B. PPG Paints: www.ppgpaints.com.
- C. Sherwin-Williams Company (The): www.sherwin-williams.com.

2.02 PAINT, GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
 - 3. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Colors: As selected by Architect from manufacturer's full range.

2.03 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Construction Manager to stop applying high performance coatings if test results show materials being used do not comply with product requirements. Remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers, and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Wood: 15 percent.
 - 3. Gypsum Board: 12 percent.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and 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.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat 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. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but no less than the following:
 1. SSPC-SP 3, "Power Tool Cleaning."
 - 1. SSPC-SP 3, Power Tool Cleaning.
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- H. Wood Substrates:
 - 1. Sand surfaces that will be exposed to view, and dust off.
 - 2. Prime edges, ends, faces, undersides, and backsides of wood.
 - 3. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.

- 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. 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.

3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 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.

3.06 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Eggshell, Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by manufacturer.
 - 1) Moore: Fresh Start All Purpose 100% Acrylic Int/Ext Latex Primer #023.
 - 2) PPG: 4-603XI Perma-Crete Concrete and Stucco Alkali Resistant Primer.
 - 3) SW: Loxon Acrylic Masonry Primer LX02 Series.
 - b. First and Second Coats: Low-luster (eggshell or satin), exterior, acrylic-latex paint applied at spreading rate recommended by manufacturer.
 - 1) Moore: Moorcraft Super Spec Low Lustre Latex #185.
 - 2) PPG: 6-2045XI Series Speedhide Exterior Satin House and Trim.
 - 3) SW: A-100 Exterior Latex Satin A82 Series.
 - 2. Semi-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Alkali-resistant, exterior, acrylic-latex primer applied at spreading rate recommended by manufacturer.
 - 1) Moore: Fresh Start All Purpose 100% Acrylic Int/Ext Latex Primer #023.
 - 2) PPG: 4-603XI perma-Crete Concrete and Stucco Alkali Resistant Primer.
 - 3) SW: Loxon Acrylic Masonry Primer LX02 Series.
 - b. First and Second Coats: Semi-gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by manufacturer.

- 1) Moore: Moorcraft Super Spec Low Lustre Latex #185.
- 2) PPG: 6-900XI Series Speedhide Exterior Semi-Gloss Latex House and Trim Paint.
- 3) SW: Metalatex Acrylic Semi-Goss B42 Series.
- B. Steel Substrates:
 - 1. Full Gloss, Acrylic Enamel Finish: 2 finish coats over a rust-inhibitive primer.
 - a. Prime Coat: Rust inhibitive metal primer, as recommended by manufacturer.
 - 1) Moore: IMC Acrylic Metal Primer M04.
 - 2) PPG: 4020 Pitt-Tech Plus Int/Ext DTM Industrial Primer.
 - 3) S-W: Pro Industrial Pro-Cryl Universal Primer B66-310 Series.
 - b. First and Second Coats: Full-gloss, waterborne, acrylic enamel applied at spreading recommended by manufacturer.
 - 1) Moore: DTM Acrylic Gloss Enamel M28.
 - 2) PPG: 90-1310 Pitt-Tech Plus High Gloss DTM Industrial Enamel.
 - 3) S-W: A-100 Exterior Latex Gloss A8W100 Series.
 - 2. Heat Resistant Coating to 205 degC (400 degF):
 - a. Primer/Finish:
 - 1) PPG: High Heat Silicone Acrylic Enamel 97-710
 - 2) S-W: Industrial Silicone Alkyd DTM Enamel CX07-588.
 - 3. Heat Resistant Coating to 400 degC (750 degF):
 - a. Inorganic Zinc:
 - 1) Primer/Finish.
 - (a) PPG: Metalhide High Heat Inorganic Zinc Primer 97-673
 - (b) S-W: Hi Temp Gray Primer/Finish MB073-800.
 - b. Heat Resistant Aluminum Finish:
 - 1) Primer.
 - (a) PPG: Not required
 - (b) S-W: Hi Temp Gray Primer/Finish MB073-800.
 - 2) Finish.
 - (a) PPG: Speedhide Heat Resistant Coating Aluminum 6-220
 - (b) S-W: Hi Temp Aluminum Topcoat MB091-20.
- C. Galvanized Steel Substrates: Provide the following finish systems over exterior zinc-coated (galvanized) metal primer. Test for passivators. Prepare surface properly, if present.
 - 1. Full Gloss, Acrylic Enamel Finish: 2 finish coats over a galvanized metal primer.
 - a. Prime Coat: Galvanized metal primer, applied at spreading rate as recommended by manufacturer.
 - 1) Moore: IMC Acrylic Metal Primer M04.
 - 2) PPG: 90-912 Pitt-Tech Plus Int/Ext DTM Industrial Enamel.
 - 3) S-W: DTM Wash Primer B71Y1.
 - b. First and Second Coats: Full-gloss, waterborne, acrylic enamel applied at spreading recommended by manufacturer.
 - 1) Moore: DTM Acrylic Gloss Enamel M28.
 - 2) PPG: 90-912 Pitt-Tech Plus Int/Ext DTM Industrial Enamel.
 - 3) S-W: A-100 Exterior Latex Gloss A8 Series.
- D. Wood Substrates: Including wood trim, doors, and wood-based panel products.
 - 1. Semi-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Exterior, alkali-resistant, acrylic-latex based primer, applied at spreading rate as recommended by manufacturer.
 - 1) Moore: Fresh Start All Purpose 100% Acrylic Primer #023.
 - 2) PPG: Seal Grip Int/Ext Acrylic Universal Primer 17-921.
 - 3) SW Exterior Latex Wood Primer B42W8041.
 - b. First and Second Coats: Semi-Gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by manufacturer.

- 1)
- Moore: 185 Moorcraft Super Spec Low Lustre House Paint (100 g/L). PPG: 6-900XI Series Speedhide Ext. Semi-Gloss Latex House & Trim Paint. 2)
- 3) A-100 Exterior Latex Gloss Paint A8 Series. SW

SECTION 09 9123 INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and the application of paint systems on interior substrates.

1.02 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.
- B. ASTM D16 Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- C. ASTM D523 Standard Test Method for Specular Gloss.
- D. CAL (CDPH SM) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.
- E. MPI (APSM) Master Painters Institute Architectural Painting Specification Manual.
- F. SSPC-PA 1 Shop, Field, and Maintenance Coating of Metals.
- G. SSPC-SP 3 Power Tool Cleaning.

1.03 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D16 apply to this Section.
- B. Sheen: As defined by MPI (APSM).
 - 1. Wherever reference is made to sheen finish or gloss, provide reflectivity, when measured with a gloss meter per ASTM D523, as follows for each designation:
 - a. Gloss Level 1: Flat: Not more than 10 units, at a 85 degree meter.
 - b. Gloss Level 3: Eggshell: Not less than 10 units, nor more than 25 units, at a 60 degree meter.
 - c. Gloss Level 4: Satin: Not less than 20 units, nor more than 35 units, at a 60 degree meter.
 - d. Gloss Level 5: Semi-Gloss: Not less than 35 units, nor more than 70 units, at a 60 degree meter.
 - e. Gloss Level 6: Full Gloss: Not less than 70 units, nor more than 85 units, at a 60 degree meter.
 - f. Gloss Level 7: High Gloss: More than 85 units at a 60 degree meter.

1.04 SUBMITTALS

- A. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.

1.05 DELIVERY, STORAGE, AND HANDLING

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

- 1. Maintain containers in clean condition, free of foreign materials and residue.
- 2. Remove rags and waste from storage areas daily.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Benjamin Moore & Co. (Moore): www.benjaminmoore.com.
- B. PPG Paints (PPG): www.ppgpaints.com.
- C. Sherwin-Williams Company (The) (SW): www.sherwin-williams.com.

2.02 PAINT, GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Material Compatibility:
 - 1. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- C. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of CAL (CDPH SM).
- E. Colors: As selected by Architect from manufacturer's full range.
- F. Finish Sheen Schedule:
 - 1. Provide the following finish paint sheens, unless indicated otherwise.
 - a. Gypsum board wall surfaces- general: Eggshell/satin.
 - b. Gypsum board wall surfaces- toilet, soiled room, and similar: Semi-gloss.
 - c. Gypsum board ceiling surfaces: Flat or satin.
 - d. Hollow Metal Doors and Frames: Semi-gloss.

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Project No. 23245-00 Interior Painting Section 09 9123 - 2 e. Steel Handrails and Guardrails: Semi-gloss.

2.03 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers and other conditions affecting performance of the work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Wood: 15 percent.
 - 3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and 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 dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat 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. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 - 1. SSPC-SP 3, "Power Tool Cleaning."
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- 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. Wood Substrates:

- 1. Sand surfaces that will be exposed to view, and dust off.
- 2. Prime edges, ends, faces, undersides, and backsides of wood.
- 3. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in MPI (APSM).
 - 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.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. 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.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.04 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 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.

3.06 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Semi-Gloss, Acrylic-Enamel Finish: 2 finish coats over a block filler and primer.
 - a. Primer: Alkali-resistant, acrylic-latex primer applied at spreading rate recommended by manufacturer.
 - 1) Moore: N534 Ultra Spec 500 Interior Latex Primer.
 - 2) PPG: 4-603XI Perma-Crete Alkali Resistant Primer.
 - 3) SW: ProMar 200 Zero VOC Interior Latex Primer B28W2600 Series.
 - b. First and Second Coats: Semi-gloss, interior, acrylic-latex enamel applied at spreading rate recommended by manufacturer.
 - 1) Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish.
 - 2) PPG: 6-4510XI Speed Hide Zero VOC Semi-Gloss Interior Latex.
 - 3) SW: ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series.
- B. Steel Substrates:
 - 1. Semi-Gloss, Acrylic Enamel Finish: Two finish coats over a prime coat.
 - a. Prime Coat: Quick-drying, rust inhibitive, acrylic latex based primer, applied at spreading rate recommended by manufacturer.
 - 1) Moore: P04 Super Spec HP Acrylic Metal Primer.
 - 2) PPG: 4020 Pitt-Tech Plus Int/Ext DTM Industrial Primer.
 - 3) SW: Pro-Cryl Universal Primer B66-01310 Series.
 - b. First and Second Coats: Low odor, semi-gloss, acrylic latex interior enamel applied at spreading recommended by manufacturer.
 - 1) Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish.
 - 2) PPG: 6-4510XI Speed Hide Zero VOC Semi-Gloss Interior Latex.
 - 3) SW: Pro Industrial Semi-Gloss B53W1151.
- C. Galvanized-Metal Substrates:
 - 1. Semi-Gloss, Acrylic Enamel Finish: Two finish coats over a galvanized metal primer.
 - a. Prime Coat: Galvanized metal primer, applied at spreading rate recommended by manufacturer.
 - 1) Moore: P04 Super Spec HP Acrylic Metal Primer.
 - 2) PPG: 4020 Pitt-Tech Plus Int/Ext DTM Industrial Primer.
 - 3) SW: Pro-Cryl Universal Primer B66-310 Series.

- b. First and Second Coats: Low odor, semi-gloss, acrylic latex interior enamel applied at spreading recommended by manufacturer.
 - 1) Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish.
 - 2) PPG: 6-4510XI Speed Hide Zero VOC Semi-Gloss Interior Latex.
 - 3) SW: ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series.
- D. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - 1. Latex System:
 - a. Primer:
 - 1) Moore:
 - 2) PPG: 17-921XI Seal Grip Int/Ext Acrylic Universal Primer/Sealer
 - b. Finish Coat:
 - 1) Moore:
 - 2) PPG: Speed Hide Zero VOC line.
- E. Wood Substrates: Including wood trim, architectural woodwork, doors, and wood-based panel products.
 - 1. Semi-Gloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.
 - a. Primer: Acrylic-latex-based, interior wood primer, applied at spreading rate recommended by manufacturer.
 - 1) Moore: N534 Ultra Spec 500 Interior Latex Primer.
 - 2) PPG: 17-921XI Seal Grip Int/Ext Acrylic Universal Primer/Sealer.
 - 3) SW: ProBlock Interior/Exterior Latex Primer/Sealer B51 Series.
 - b. First and Second Coats: Semi-gloss, interior, acrylic-latex, enamel applied at spreading rate recommended by manufacturer.
 - 1) Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish.
 - 2) PPG: 6-4510XI Speed Hide Zero VOC Semi-Gloss Interior Latex.
 - 3) SW: ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series.
- F. Gypsum Board Substrates:
 - 1. Flat, Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by manufacturer.
 - 1) Moore: N534 Ultra Spec 500 Interior Latex Primer.
 - 2) PPG: 6-4900XI Speed Hide Zero VOC Interior Latex Primer.
 - 3) SW: ProMar 200 Zero Interior Latex Primer B28W02600.
 - b. First and Second Coats: Flat acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer.
 - 1) Moore: N536 Ultra Spec 500 Interior Flat Finish.
 - 2) PPG: 6-4110XI Speed Hide Zero VOC Flat Interior Latex.
 - 3) SW: ProMar 200 Zero Interior Latex Flat B30-2600 Series.
 - 2. Eggshell, Acrylic-Enamel Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by manufacturer.
 - 1) Moore: N534 Ultra Spec 500 Interior Latex Primer.
 - 2) PPG: 6-4900XI Speed Hide Zero VOC Interior Latex Primer.
 - 3) SW: ProMar 200 Zero Interior Latex Primer B28W02600.
 - b. First and Second Coats: Low-luster eggshell, acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer.
 - 1) Moore: N538 Ultra Spec 500 Interior Eggshell Finish.
 - 2) PPG: 6-4310XI Speed Hide Zero VOC Eggshell Int. Latex.
 - 3) SW: ProMar 200 Zero Interior Latex Egg-Shell B20-2600 Series.
 - 3. Semi-Gloss, Acrylic Finish: 2 finish coats over a primer.
 - a. Primer: Latex-based, interior primer applied at spreading rate recommended by manufacturer.
 - 1) Moore: N534 Ultra Spec 500 Interior Latex Primer.
 - 2) PPG: 6-4900XI Speed Hide Zero VOC Interior Latex Primer.

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- SW: ProMar 200 Zero Interior Latex Primer. 3)
- b. First and Second Coats: Semi-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by manufacturer.
 - Moore: N539 Ultra Spec 500 Interior Semi-Gloss Finish. 1)
 - PPG: 6-4510XI Speed Hide Zero VOC Semi-Gloss Interior Latex. 2)
 - 3) SW: ProMar 200 Zero Interior Latex Semi-Gloss B30-2600 Series
- G. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings. 1.
 - Flat, Acrylic Finish: 2 finish coats. Add fungicidal agent to render fabric mildew proof.
 - First and Second Coats: Flat acrylic-latex, interior enamel applied at spreading rate a. recommended by manufacturer.
 - Moore: N536 Ultra Spec 500 Interior Flat Finish. 1)
 - PPG: 6-4900XI Speed Hide Zero VOC Interior Latex. 2)
 - 3) SW: ProMar 200 Zero Interior Latex Flat B30-2600 Series.

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SECTION 09 9153 FLOOR MARKING PAINT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and the application of floor marking paint systems for safety zones.

1.02 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

1.03 DEFINITIONS

A. General: Standard coating terms defined in ASTM D16 apply to this Section.

1.04 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 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.
- D. 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. VOC content.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gallon of each material and color applied.

1.06 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 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.07 FIELD CONDITIONS

- A. Apply floor marking paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degF.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degF above the dew point; or to damp or wet surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Finishes, Inc.
 - 3. Sherwin-Williams Company (The).

2.02 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

- 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- B. Proceed with application only after unsatisfactory conditions have been corrected.
 - 1. Application of marking paint indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates indicated.
- B. Clean substrates of substances that could impair bond of marking paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
- C. 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.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 1. SSPC-SP 3 Power Tool Cleaning.

3.03 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Use applicators and techniques suited for paint and substrate indicated.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.04 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing marking 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.

3.05 FLOOR MARKING PAINT SCHEDULE

- A. Concrete Floor Surfaces:
 - 1. Egress Path and Traffic Marking Paint: 100 percent acrylic latex floor marking paint, 4 mils thick.
 - a. Moore: P58 Safety & Zone Marking Paint.
 - b. PPG: Speedhide 11-23 Series Traffic and Zone Marking Latex.
 - c. SW: Setfast Low VOC Acrylic Marking Paint TM5626/TM5627.
 - 2. Safety Zone Marking Paint: 100 percent acrylic latex floor marking paint, 4 mils thick.
 - a. Moore: P58 Safety & Zone Marking Paint.
 - b. PPG: Speedhide 11-23 Series Traffic and Zone Marking Latex.
 - c. SW: Setfast Low VOC Acrylic Marking Paint TM5626/TM5627.

END OF SECTION

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Project No. 23245-00 Floor Marking Paint Section 09 9153 - 2

SECTION 10 1423 PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design.
- B. ICC A117.1 Accessible and Usable Buildings and Facilities.

1.03 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
 - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - c. Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.
- E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.
- F. Verification Samples: Submit samples showing colors, materials, and finishes specified.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- H. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store under cover and elevated above grade.
- D. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:

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Flad Architects
- 1. Basis of Design: APCO Signs; Series 5100 Sign Bar/Sign Panel System: www.apcosigns.com.
- 2. Vista System LLC: www.vistasystem.com/#sle.
- 3. ASI Signage Innovations; www.asisignage.com

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

- A. Panel Signage Type PS1:
 - 1. Application: Room and door signs.
 - 2. Description: Flat signs with applied character panel media, tactile characters.
 - 3. Sign Size: As indicated on drawings.
 - 4. Total Thickness: 1/8 inch.
 - 5. Sign Edges: Squared.
 - 6. Letter Edges: Squared.
 - 7. Corners: Squared.
 - 8. Color and Font, unless otherwise indicated:
 - a. Character Font: Helvetica, Arial, or other sans serif font.
 - b. Character Case: Upper and lower case (title case).
 - c. Background Color: As scheduled.
 - d. Character Color: Contrasting color.
 - 9. Material: One-piece injection molded acrylic plastic with raised letters and braille.
 - 10. Material: Acrylic plastic base with applied plastic letters and braille.
 - 11. Tactile Letters: Raised 1/32 inch minimum.
 - 12. Braille: Grade II, ADA-compliant.
- B. Exterior Panel Signage Type PS2:
 - 1. Exterior Post and Panel Signs
 - 2. Description: Flat sign, aluminum panel, double sided.
 - 3. Graphics: Pressure Sensitive Vinyl.
 - 4. Size: As indicated on drawings.
 - 5. Non-illuminated.

2.04 SIGNAGE APPLICATIONS

- A. Room and Door Signs:
 - 1. Office Doors: Identify with room names and numbers to be determined later, not those indicated on drawings; provide "window" section for replaceable occupant name.
 - 2. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
 - 3. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- B. Traffic Signs: To match campus standards; locate where indicated on drawings.
- C. Exterior Signs:
 - 1. Aluminum Panel mounted on two aluminum posts set in concrete.

2.05 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel or other.
- B. Exposed Screws: Stainless steel.
- C. Tape Adhesive: Double-sided tape, permanent adhesive.
- D. Concrete: See Section 03 3000 Cast-in-Place Concrete.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

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SECTION 10 2800 TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Utility room accessories.

1.02 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design.
- B. ASTM A269/A269M Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- C. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM C1036 Standard Specification for Flat Glass.
- F. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- G. ASTM C1503 Standard Specification for Silvered Flat Glass Mirror.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.04 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- B. Samples: Submit two samples of each accessory, illustrating color and finish.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. ASI American Specialties, Inc: www.americanspecialties.com.
 - 2. Bobrick Corporation: wwwbobrick.com.
 - 3. Bradley Corporation: www.bradleycorp.com.
 - 4. Georgia-Pacific Professional: www.gppro.com/#sle.

2.02 MATERIALS

- A. Accessories General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Keys: Provide two keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

- F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- H. Adhesive: Two component epoxy type, waterproof.
- I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. TP1 Toilet Paper Dispenser: Double roll, twin jumbo, surface-mounted bracket type, stainless steel unit with pivot hinge, tumbler lock.
 - 1. Products:
 - a. Bobrick Washroom Equipment; #B-2892.
- B. TP2 Combination Toilet Paper/Seat Cover Dispenser with Napkin Disposal: Double roll; Surface mounted, stainless steel; seamless wall flanges, continuous piano hinges.
 - 1. Minimum capacity: 1000 seat covers.
 - 2. Waste receptacle capacity: 1.3 gallons.
 - 3. Products:
 - a. Bradley Corporation; #5912.
- C. PTD1 Paper Towel Dispenser: Manual, roll paper type.
 - 1. Cover: Stainless steel.
 - 2. Paper Discharge: Manual dispense by lever operation.
 - 3. Capacity: 6-inch diameter roll.
 - 4. Mounting: Surface mounted.
 - 5. Refill Indicator: Transparent viewing slot.
 - 6. Products:
 - a. Basis of Design; Bobrick Washroom Equipment; #B-2860.
- D. WR1 Waste Receptacle: Stainless steel, freestanding style with swing top.
 - 1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of four points with stainless steel grommets and hooks.
 - 2. Minimum capacity: 10 gallons.
 - 3. Products:
 - a. Bobrick Washroom Equipment; #B-2260.
- E. WR2 Combination Towel Dispenser/Waste Receptacle: Recessed with projecting waste receptacle, stainless steel; seamless wall flanges, continuous piano hinges.
 - 1. Waste receptacle liner: Reusable, heavy-duty vinyl.
 - 2. Towel dispenser capacity: 700 multifold.
 - 3. Waste receptacle capacity: 12 gallons.
 - 4. Products:
 - a. Bradley Corporation; #234-00.
- F. SP Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level, tumbler lock.
 - 1. Minimum Capacity: 48 ounces.
 - 2. Products:
 - a. Bobrick Washroom Equipment; #B-2111.
- G. MR1 Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
 - 1. Size: 18 inches wide by 36 inches high.
 - 2. Frame: 0.75 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 3. Material: Stainless steel.

- 4. Basis of Design:
 - a. Bobrick Washroom Equipment; B-2920 Series. Provide indicated product or comparable by the following:
 - 1) Bradley Corporation; Model #781.
- H. GB1 Grab Bars: Stainless steel, smooth surface.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings.
 - e. Basis of Design:
 - 1) Bobrick Washroom Equipment: #B-6806 Series.
- I. SNDS Sanitary Napkin Disposal Unit: Type 304 22 guage Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Exposed Surfaces: Satin finish.
 - 2. Basis of Design; Bobrick Washroom Equipment; Contura Series; Model #270.

2.05 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. SCR Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for concealed mounting.
 - 1. Basis of Design: Bobrick Washroom Equipment; #207.
 - a. Stainless steel shower curtain hook:
 - 1) Bobrick Washroom Equipment; Model #204-1.
- B. SC1 Shower Curtain:
 - 1. Material: Nylon reinforced vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 - 2. Size: 36 by 72 inches, hemmed edges.
 - 3. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
 - 4. Color: White.
 - 5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
- C. SST1 Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand and L-shaped, left hand seat.
 - 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
 - 2. Size: ADA Standards compliant.
 - 3. Products: Bradley Corporation; #9562.
- D. RH1 Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
 - 1. Products: Bobrick, #B-6717.

2.06 UTILITY ROOM ACCESSORIES

- A. Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, hat-shaped channel.
 - 1. Holders: Four spring-loaded rubber cam holders.
 - 2. Length: Manufacturer's standard length for number of holders.
 - 3. Products:
 - a. American Specialties, Inc; #0796-4: www.americanspecialties.com/#sle.
- B. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: Two, 0.06 inch stainless steel rag hooks at shelf front.

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- 3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
- 4. Length: Manufacturer's standard length for number of holders/hooks.
- 5. Products:
 - a. American Specialties, Inc; #1315-3: www.americanspecialties.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

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

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.

3.04 PROTECTION

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

SECTION 10 4400 FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 REFERENCE STANDARDS

- A. FM (AG) FM Approval Guide.
- B. NFPA 10 Standard for Portable Fire Extinguishers.
- C. UL (DIR) Online Certifications Directory.

1.03 SUBMITTALS

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

1.04 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group JL Industries: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 4. Nystrom, Inc: www.nystrom.com.
 - 5. Amerex Corporation: www.amerex-fire.com.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. JL Industries: www.activarcpg.com/#sle.
 - 2. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 3. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 4. Nystrom, Inc: www.nystrom.com.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. FE1 Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Cartridge Operated: Spun shell.
 - 2. Class: A:B:C type.
 - 3. Size: 10 pound.
 - 4. Size and classification as scheduled.
 - 5. Finish: Baked polyester powder coat, red color.
 - 6. Temperature range: Minus 65 degrees F to 140 degrees F.

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2.03 FIRE EXTINGUISHER CABINETS

- A. FEC 1 Basis of Design: Activar Construction Products Group, Inc. JL Industries; Cosmopolitan 1035G10: www.activarcpg.com.
- B. Cabinet Construction: Non-fire rated.
 - 1. Formed primed steel sheet; 0.036 inch thick base metal.
- C. Cabinet Configuration: Recessed type.
 - 1. Size to accommodate accessories.
 - 2. Trim: Flat square edge, with 1 inch wide face.
 - 3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- D. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Fabrication: Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Cabinet Signage: As required by authorities having jurisdiction.
 - 1. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER"."
 - a. Location: Applied to cabinet door.
 - b. Application Process: Pressure-sensitive vinyl letters.
 - c. Lettering Color: Red.
 - d. Orientation: Vertical.
- C. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level, in locations and at mounting heights acceptable to authorities having jurisdiction.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

SECTION 10 5613 METAL STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Four post shelving.
- B. Shelving accessories.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
- B. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
- C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

1.06 WARRANTY

- A. See Section 01 7800 Closeout Submittals, for additional warranty requirements.
- B. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Four Post Shelving:

2.02 SHELVING - GENERAL

- A. Seismic Design: Design for Seismic Zone 3, in accordance with ASCE 7, Section 9.
- B. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
 - 1. Provide hardware of type recommended by manufacturer for substrate.

2.03 FOUR POST SHELVING

- A. Four Post Shelving: Steel post-and-beam type with sway bracing, shelving brackets, shelving surfaces, and accessories as specified.
 - 1. Unit Width: 36 inches, center to center of posts.
 - 2. Shelf Capacity: Uniform distributed load of 50 psf, minimum.
 - 3. Shelf Beam Capacity: [] Ibs per shelving bay.
 - 4. Shelf Deflection: L/140, maximum, under specified uniform load.
 - 5. Adjustability of Shelving: At intervals of 6 inches on center, minimum.
 - 6. Shelf Depth: 14-1/2 inches, minimum.

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- 7. Unit Depth: Not more than 1/4 inch greater than shelf depth.
- 8. Clear Shelf Opening Height: [_] inches , minimum.
- 9. Shelves per Unit: As indicated on drawings.
- 10. Unit Height: [_] inches, overall , maximum.
- 11. Finish: Baked enamel, medium gloss.
- 12. Color: As selected by Architect from manufacturer's standard range.
- 13. Provide single-face and double-face units where indicated.
- 14. Number of Units: As indicated on drawings.
- B. Posts and Beams: Formed sheet members; perforations exposed on face of members are not acceptable.
 - 1. Metal Thickness: 16 gauge, 0.0598 inch.
 - 2. Post Shape: Tee intermediate posts, angle end posts forming corners.
 - 3. Post Face Width: 2 inches, maximum.
 - 4. Connecting Hardware: Manufacturer's standard.
- C. Bracing: Formed sheet members.
 - 1. Back Sway Bracing: Either strap or panel; at back of each unit.
 - 2. Side Sway Bracing: Either strap or panel; at each side of each unit.
 - 3. Strap Sway Bracing: One strap installed diagonally, 16 gauge, 0.0598 inch; welded, riveted, or bolted to uprights.
 - 4. Panel Sway Bracing: Formed sheet metal panels, 20 gauge, 0.0359 inch; welded, riveted, or bolted to uprights.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Verify that walls are suitable for shelving attachment.
- C. Do not begin installation until substrates have been properly prepared.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
- C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.
- D. Out-Of-Square Tolerance Four Post Shelving: Maximum of 1/8 inch difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

3.05 PROTECTION

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

SECTION 10 7313 AWNINGS

PART 1 GE NERAL

1.01 SECTION INCLUDES

A. Metal awnings.

1.02 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

1.03 SUBMITTALS

- A. Metal Product Data: Product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.
- B. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, graphic images, patterns, accessories, and locations.
- C. Verification Samples: Two samples, minimum size 2 by 3 inches, representing actual material and finish of exposed metal.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Executed warranty.
- G. Specimen warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide two-year manufacturer warranty for awning material. Complete forms in Owner's name and register with manufacturer.
- C. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of factory-applied finishes. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Awnings:
 - 1. Architectural Louvers, Co. (Harray, LLC); www.archlouvers.com.

2.02 AWNINGS - GENERAL

- A. Design Criteria: Design and fabricate to resist the following loads without failure, damage, or permanent deflection:
 - 1. Wind: 60 psf positive, 60 psf negative; minimum. Wind loads are ultimate level loads.
 - 2. Live: 20 psf; minimum.
 - 3. Thermal Movement: Plus/minus 1/8 inch, maximum.
- B. Configuration: As indicated on drawings.
- C. Provide a complete system ready for erection at project site.
- D. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

2.03 METAL AWNINGS

- A. Basis of Design: Architectural Louvers, Inc.; H8CV 8 Inch Solid Extruded Aluminum Awning: www.archlouvers.com/Awning_H8CV.htm
- B. Description: Flat, sloped, or gabled metal framework with metal covering attached to building exterior over a door or window to protect from sun or rain.
- C. Type: Face-mounted.
- D. Size: As indicated on drawings.
- E. Framework: Aluminum.
- F. Covering Materials:
 - 1. Interlocking extruded aluminum decking modules.

2.04 FABRICATION - FRAMING

- A. Fit and shop assemble components in largest practical sizes, for delivery to site.
- B. Fabricate components with joints tightly fitted and secured.
- C. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- D. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.
- E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- F. Accurately form components to suit each other and to building structure.

2.05 FINISHES

- A. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
- B. Finish Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION - FRAMING

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Provide anchors required for connecting framing to structure. Anchor framing to structure.
- D. Field weld anchors as indicated on drawings. Grind welds smooth. Touch-up welds with primer.
- E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 INSTALLATION - METAL COVERING

- A. Install in accordance with manufacturer's instructions.
- B. Fasten metal covering panels to metal support members, aligned level and plumb.
- C. Install fascia panels, trim, and flashing.
- D. Separate dissimilar metals using concealed bituminous paint.
- E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

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3.05 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Misalignment From True Position: 1/4 inch.

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SECTION 10 7500 FLAGPOLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum Flagpoles.

1.02 REFERENCE STANDARDS

- A. AASHTO M 36 Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.
- B. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM B221M Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- D. NAAMM FP 1001 Guide Specifications for Design Loads of Metal Flagpoles.

1.03 SUBMITTALS

- A. Product Data: Provide data on pole, accessories, and configurations.
- B. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.
- B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:

2.02 FLAGPOLES

- A. Flagpoles: Designed in accordance with NAAMM FP 1001
 - 1. Material: Aluminum.
 - 2. Design: Cone tapered.
 - 3. Mounting: Ground mounted type.
 - 4. Nominal Height: [____] ft; measured from nominal ground elevation.
 - 5. Halyard: Internal type, electric operation.
- B. Performance Requirements:
 - 1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to [____] miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.03 POLE MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

2.04 ACCESSORIES

- A. Finial Ball: Aluminum, 6 inch diameter.
- B. Flag: [____] design, 5 ft by 8 ft size, nylon fabric, brass grommets, hemmed edges.

2.05 OPERATORS

A. Hand Crank: Removable [_____] type.

2.06 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36, corrugated 16 gauge, 0.0598 inch steel, galvanized, depth of [____] inches as indicated.

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- B. Pole Base Attachment: Flush; steel base with base cover.
- C. Lighting Ground Rod: [____] inch long copper rod, 3/4 inch diameter.
- D. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.07 FINISHING

- A. Metal Surfaces in Contact With Concrete: Asphaltic paint.
- B. Aluminum: Mill finish.
- C. Finial: Gold anodized finish.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

- A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.
- B. Electrically ground flagpole installation.
- C. Fill foundation tube sleeve with concrete specified in Section 03 3000.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

3.06 SCHEDULES

A. Front Yard Pole: One 40 feet (12.2 m), with U.S. flag.

SECTION 11 1136 VEHICLE CHARGING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric vehicle charging units.

1.02 REFERENCE STANDARDS

- A. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. NFPA 70 National Electrical Code.
- C. UL 2202 Standard for Electric Vehicle (EV) Charging System Equipment.
- D. UL 2231-1 Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements.
- E. UL 2231-2 Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems.
- F. UL 2594 Standard for Electric Vehicle Supply Equipment.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate this work with other installers to provide required electric power for specified charging units and accessory equipment being installed at designated locations.
 - 2. Coordinate this work with other installers to provide readily accessible location for disconnection as indicated and as required by NFPA 70.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents, and obtain documented directions before proceeding with this work.
- B. Manufacturer's charges associated with providing Cloud-Based Services subscriptions as necessary for charging unit operation to be paid by Owner.

1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's standard catalog and data sheets for charging units and installed accessories; include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.
- B. Manufacturer's Installation Instructions: Submit necessary application conditions and limitations of use stipulated by product testing agency; include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- C. Field quality control test reports.
- D. Maintenance Contracts.
- E. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
 - 1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
- F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company with minimum three years documented experience with similar charging units; manufacturer's authorized installer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

1.07 WARRANTY

A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Electric Vehicle Charging Units:
 - Blink Charging Co; [____]: www.blinkcharging.com/#sle. ChargePoint, Inc; [____]: www.chargepoint.com/#sle. 1.
 - 2.
 - FLO (FLO Services USA Inc. in USA, and Services FLO Inc. in Canada); []: 3. www.flo.com/#sle.
 - 4. Xeal Energy; []: www.xealenergy.com/#sle.
 - Source Limitations: Furnish electric vehicle charging units and accessory equipment 5. produced by single manufacturer and obtained from single supplier.

2.02 ELECTRIC VEHICLE CHARGING UNITS

- Provide electric vehicle charging units in compliance with NFPA 70 and including required Α. equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides functional intent indicated.
- B. General Requirements:
 - 1. Listed and labeled as complying with UL 2594 or UL 2202.
 - 2. Provide personnel protection, including charge circuit interruption device (CCID), in accordance with UL 2231-1 and UL 2231-2.
 - Enclosure Environment Type: In compliance with NEMA 250, Type 3R or Type 4, unless 3. otherwise indicated.
 - Service Conditions: Provide charging units suitable for operation between minus 22 and 4. 122 degrees F without derating.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings of charging units are consistent with indicated requirements.
- C. Verify that charging unit locations indicated are free from obstructions and meet manufacturer's minimum clearance requirements.
- D. Verify that mounting surfaces are ready to receive charging units.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to charging units.
- F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install charging units plumb and level.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 Quality Requirements, for additional requirements.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Program system parameters according to requirements of Owner.
- D. Confirm network connectivity.
- E. Test system for proper operation.
- F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Location: At project site.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

- A. Provide to Owner, a proposal as an alternate to the base bid, a separate maintenance contract for service and maintenance of charging units for one year from Date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- B. Provide trouble call-back service upon notification by Owner:
 - 1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 - 2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

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SECTION 11 4700 ICE MACHINES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertop ice maker and dispenser.

1.02 REFERENCE STANDARDS

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory.

1.03 SUBMITTALS

- A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each ice machine specified.
- B. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of experience.
- B. Electric Appliances: Listed and labeled by UL (EAUED) and complying with NEMA standards.

1.05 WARRANTY

- A. Provide Two year manufacturer warranty on parts and labor.
- B. Provide Five year manufacturer warranty on compressor.

PART 2 PRODUCTS

2.01 COUNTERTOP ICE MAKER AND DISPENSER

- A. Basis of Design: Manitowoc; Model NS12 Countertop Nugget Ice Maker and Dispenser. Provide indicated product or comparable approved by Architect.
 - 1. Hoshizaki America, Inc.
 - 2. Kold Draft.
 - 3. Manitowoc.
- B. Unit shall be countertop, air-cooled ice nugget maker. Unit shall have capacity of 260 pounds of ice per day (24 hours) at an ambient air temperature of 70 degF and a water inlet temperature of 50 degF with storage capacity of 12 pounds. Self cleaning.
 - 1. Size: Nominal 16 inches wide by 24 inches deep by 35 inches tall.
 - 2. Dispense Opening: 10-1/2 inches, from grate to chute.
 - 3. Finish: Stainless steel.
 - 4. Refrigerant: R-404a refrigerant.
 - 5. Provide with legs.
- C. Ice Shape: Nuggets consisting of small pieces ranging from 3/8 inch to 1/2 inch in width and length. Chewable texture
- D. Dispensing Mechanism: Lever activated or touchless.
- E. The ice making mechanism shall have a heavy duty, hermetically sealed compressor; automatic expansion valve refrigerant control; safety control thermostat to turn off ice maker should inlet water pressure become insufficient for ice production or if storage bin reaches maximum capacity.
 - 1. Evaporator to be close tolerance brass cylinder with brass shell, stainless steel auger, completely insulated with polyurethane foam. Auger to be powered by belt-driven single reduction worm gear.
 - 2. Condensing unit to be air cooled.
- F. Provide unit with automatic flush system when bin control is activated, removable/cleanable air filter, and gear motor overload protection.

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- G. Installation: Free standing countertop.
- H. Plumbing Requirements:
 - 1. Water Supply: Minimum 3/8 inch I.D. copper or equivalent.
 - 2. Drain: 3/4 inch independent connection.
- I. Electrical Requirements:
 - 1. 115 V, 60 Hz, 1 ph, 15 A, with 6 foot power cord for plug-in connection.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 INSTALLATION

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

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

SECTION 11 8226 FACILITY WASTE COMPACTORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged waste compactor with integral container.

1.02 REFERENCE STANDARDS

- A. ANSI Z245.2 American National Standard for Equipment Technology and Operations for Wastes and Recyclable Materials — Stationary Compactors - Safety Requirements for Installation, Maintenance, Operation, Modification and Repair.
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
- C. NEMA MG 1 Motors and Generators.
- D. UL (DIR) Online Certifications Directory.
- E. WASTEC (SCRG) WASTEC Listing of Rated Stationary Compactors.

1.03 SUBMITTALS

- A. Product Data: Provide unit capacities, physical dimensions, utility requirements and locations, point loads.
- B. Shop Drawings: Indicate machine location, rough-in and anchor placement dimensions and tolerances, clearances required.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Equipment access points and required space for equipment service and operation.
 - 3. Setting drawings, templates, and instructions for installing anchor bolts and other anchorages.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
- C. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
- D. Test Reports: Indicate WASTEC (SCRG) ratings accompanied with certified test results.
- E. Manufacturer's Installation Instructions: Indicate special installation requirements.
- F. Operation Data: Include description of system operation, adjusting and testing required.
- G. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.
- H. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten years of experience.

1.05 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Wastequip; Model 265XL Precision Series; www.wastequip.com.

2.02 APPLICATIONS

- A. Compactor at Loading Dock: Self-contained type, top intake, ground-fed.
 - 1. Service Conditions: Exterior, exposed to weather.
 - 2. Integral Container Size: 30 cubic yards.

2.03 COMPACTORS - GENERAL

- A. Compactors: Rated by WASTEC (SCRG) in accordance with ANSI Z245.2.
 - 1. Electrically Operated Equipment and Components: Individually UL (DIR) listed.
 - 2. Finish: Factory primed and painted.
 - 3. Color: As selected from manufacturer's standard colors.
- B. Motors: NEMA MG 1.
- C. Control Panels and Remote Equipment Enclosures: NEMA 250 Type 4 enclosures; factory finished; wall-mounted unless otherwise indicated.
- D. Discharge Containers: Heavy duty steel; factory-finished for outdoor use; manufacturer's standard type unless otherwise indicated.
- E. Anchors and Fasteners: Galvanized steel; where embedded in concrete, provide to concrete installer for installation.

2.04 SELF-CONTAINED COMPACTORS

- A. Self-Contained Compactors: Heavy duty steel body consisting of a charge box, horizontal compactor unit and integral container; hydraulically driven compaction ram; entire unit hauled away for dumping; separable remotely located power and control units.
 - 1. Waste Intake: Top, ground-fed.
 - 2. Configuration: As indicated on drawings.
 - 3. Size and Capacity:
 - a. Integral Container Size: 30 cubic yards.
 - 4. Power Unit: Hydraulic pump and oil reservoir; provide hydraulic piping and electrical connections.
 - 5. Removable side panels that facilitate cleaning behind ram.
 - 6. Controls and Safeties: Fully automatic operation.
 - a. "On/Off" key switch.
 - b. Automatic photoelectric sensor start and stop.
 - c. Emergency stop button.
 - d. "Container-Full" indicator light.
 - e. Magnetic door and container interlock.
 - f. Container removal safety signal.
 - g. Built-in container stops.
- B. Guide Rail: Provide roll-off guide rail for accurate positioning of unit, with stops.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that anchors are correctly positioned.

3.02 INSTALLATION

- A. Install unit in accordance with manufacturer's instructions and with standards required by authorities having jurisdiction.
- B. Anchor unit securely in place.
- C. Touch-up minor damaged surfaces caused during installation, and replace damaged components as directed by Architect.
- D. Adjust unit mechanism to achieve specified requirements.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate and instruct Owner on unit operation, and describe unit limitations.

SECTION 12 2400 WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 REFERENCE STANDARDS

- A. NFPA 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- B. WCMA A100.1 Safety of Window Covering Products.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- B. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- C. Certificates: Manufacturer's documentation that line voltage components are UL listed or UL recognized.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.
- F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience with shading systems of similar size and type.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 1. Shade Hardware: One year.

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- 2. Fabric: One year.
- 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 - 1. Draper, Inc; Clutch Operated FlexShade: www.draperinc.com/#sle.
 - 2. Hunter Douglas Architectural; RB500 Manual Roller Shades: www.hunterdouglasarchitectural.com/#sle.
 - 3. Levolor: www.commercial.levolor.com/#sle.
 - 4. Lutron Electronics Co., Inc; Contract Roller Manual Roller Shades: www.lutron.com/#sle.
 - 5. MechoShade Systems LLC; Mecho/7 System: www.mechoshade.com/#sle.

2.02 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Roller Shades Type RS1:
 - 1. Description Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 - a. Drop Position: Regular roll.
 - b. Roll Direction: Roll down, closed position is at window sill.
 - c. Mounting: Window jamb mounted inside, between jambs.
 - d. Size: As indicated on drawings.
 - e. Fabric: As indicated under Shade Fabric article.
 - 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Stamped steel.
 - 3. Roller Tubes: As required for type of shade operation.
 - a. Material: Extruded aluminum, clear anodized finish.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
 - d. Take-Up Roller: Manufacturer's standard roller tube pretensioned for winding lift cable in bottom-up type shades.
 - 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Exposed aluminum bottom bar, flat profile with closed ends; clear anodized finish.
 - 5. Manual Operation for Interior Shades:
 - a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - b. Drive Chain: Continuous loop beaded ball chain, 95 lb minimum breaking strength. Provide upper and lower limit stops.
 - c. Shade Lift Assistance: Manufacturer's standard spring device contained in the idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
 - d. Chain Retainer:
 - 1) Manufacturer's standard clip.
- C. Roller Shades Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
 - 1. Description: Single roller, manually operated fabric window shades.

- 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
- 3. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
 - d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
- 4. Hembars: Designed to maintain bottom of shade straight and flat.
- 5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
 - b. Brake must withstand minimum pull force of 50 lb in the stopped position.
 - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
- 6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb minimum breaking strength. Provide upper and lower limit stops.
 - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.

2.03 SHADE FABRIC

- A. Fabric for Light-Filtering Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 - 1. Manufacturers:
 - a. MechoShade Systems LLC; ThermoVeil 1000 Series (2-3% open): www.mechoshade.com/#sle.
 - 2. Material: Vinyl coated polyester.
 - 3. Performance Requirements:
 - a. Flammability: Pass NFPA 701 large and small tests.
 - 4. Openness Factor: 3%.
 - 5. Weight: 19 ounces per square yard.
 - 6. Roll Width: 63 inches.
 - 7. Color: As selected by Architect from manufacturer's full range of colors.
 - 8. Fabrication:
 - a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.
 - b. Battens: Full width of shade, enclose in welded shade fabric pocket.

2.04 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
 - 2. Horizontal Dimensions Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch total.
- C. Dimensional Tolerances: As recommended in writing by manufacturer.
- D. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

SECTION 12 3200 MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured standard and custom casework, with cabinet hardware.

1.02 DEFINITIONS

- A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.
- B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.
- C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition.
- B. BHMA A156.9 Cabinet Hardware.
- C. NEMA LD 3 High-Pressure Decorative Laminates.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. Product Data: Component dimensions, configurations, construction details, joint details, attachments.
- B. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.
- C. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
 - 1. Plastic laminate samples, for color, texture, and finish selection.
- D. Manufacturer's Qualification Statement.
- E. Maintenance Data: Manufacturer's recommendations for care and cleaning.
- F. Finish touch-up kit for each type and color of materials provided.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Acceptance at Site:
 - 1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to

unsatisfactory conditions occurs.

- C. Storage:
 - 1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.08 MOCK-UPS

- A. See Section 01 4000 Quality Requirements for additional requirements.
- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.09 WARRANTY

- A. See Section 01 7800 Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Owner. Defects include, but are not limited to:
 - 1. Ruptured, cracked, or stained finish coating.
 - 2. Discoloration or lack of finish integrity.
 - 3. Cracking or peeling of finish.
 - 4. Failure of hardware.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plastic Laminate Casework:
 - 1. Case Systems: www.casesystems.com/#sle.
 - 2. Diversified Fixture: www.diversifiedfixture.com/#sle.
 - 3. Labscape LLC: www.labscape.com/#sle.

2.02 CASEWORK, GENERAL

- A. Quality Standard: AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Types: More than one type is required. See drawings for location of each type of casework.
- C. Plastic Laminate Faced Cabinets: Custom Grade.

2.03 FABRICATION

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Construction: As required for selected grade.
- C. Structural Performance: Safely support the following minimum loads:
 - 1. Base Units: 500 pounds per linear foot across the cabinet ends.
 - 2. Drawers: 125 pounds, minimum.
 - 3. Hanging Wall Cases: 300 pounds.
- D. Seismic Performance: Casework, including attachments to other work, able to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. Component Importance Factor: 1.0.
- E. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.
- F. Hardware Application: Factory-machine casework members for hardware that is not surface applied.
- G. Fixed panels at backs of open spaces between base cabinets.
- H. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

2.04 PLASTIC-LAMINATE-CLAD CASEWORK

A. Plastic-Laminate-Clad Casework: Solid wood and wood panel construction; each unit selfcontained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.

- 1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
- 2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
 - a. Base Cabinets: 22 inches.
 - b. Tall Cabinets: 22 inches.
 - c. Wall Cabinets: 16 inches.
- 3. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
 - a. Finish: Matte or suede, gloss rating of 5 to 20.
 - b. Surface Color and Pattern: As indicated on drawings.
 - c. Exposed Interior Surfaces: Thermally fused laminate.1) Color: White.
 - d. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - e. Cap exposed plastic laminate finish edges with material of same finish and pattern.

2.05 COUNTERTOPS

A. Countertops: See Section 12 3600.

2.06 CABINET HARDWARE

- A. Comply with BHMA A156.9 requirements.
- B. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.
 - 1. Hinged Doors: Cam type lock, bright chromium plated over nickel on base material.
 - 2. Keying: Key locks alike within a space; key each room separately.
- C. Swinging Doors: Hinges, pulls, and catches.
 - 1. Hinges: Concealed, number as required by referenced standards for width, height, and weight of door.
 - a. Concealed Hinges: Installed in cabinet edge, and on door back, bright chromium plated over nickel on base material.
 - Pulls: Chrome wire pulls, 4 inches wide.
 - 3. Catches: Magnetic.
- D. Drawers: Pulls and slides.
 - 1. Pulls: Chrome wire pulls, 4 inches wide.
 - 2. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.07 MATERIALS

2.

- A. Wood-Based Materials:
 - 1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
 - 2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications. complying with Grade requirements, and standard with the manufacturer.
- C. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

2.08 ACCESSORIES

- A. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chromeplated finish in concealed locations and chrome-plated finish in exposed locations.
- B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.
- C. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

PART 3 EXECUTION

3.01 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.02 EXAMINATION

- A. Site Verification of Environmental Conditions:
 - 1. Do not deliver casework until the following conditions have been met:
 - a. Building has been enclosed (windows and doors sealed and weather-tight).
 - b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
 - c. Ceiling, overhead ductwork, piping, and lighting have been installed.
 - d. Installation areas do not require further "wet work" construction.
- B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
- C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
- D. Verify adequacy of support framing and anchors.
- E. Verify that service connections are correctly located and of proper characteristics.

3.03 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions.
- B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.
- C. Set casework items plumb and square, securely anchored to building structure.
- D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.
- E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
 - 1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
 - 2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
 - 3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
 - 4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.
 - 1. Where base cabinets are installed away from walls or service space framing, anchor to floor at toe space at not more than 24 inches on center, and at sides of cabinets with not less than two fasteners per side.
- G. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.
- H. Install hardware uniformly and precisely.
- I. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.
- J. Replace units that are damaged, including those that have damaged finishes.

3.04 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.05 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.06 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.
- C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

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SECTION 12 3600 COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for manufactured casework.
- B. Solid surface window sills.

1.02 REFERENCE STANDARDS

- A. ANSI A208.1 American National Standard for Particleboard.
- B. ANSI A208.2 Medium Density Fiberboard (MDF) for Interior Applications.
- C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition.
- E. ISFA 2-01 Classification and Standards for Solid Surfacing Material.
- F. NEMA LD 3 High-Pressure Decorative Laminates.

1.03 SUBMITTALS

- A. 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. Specimen warranty.
- B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- C. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- D. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- E. Installer's qualification statement.
- F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD 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.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - Laminate Sheet, Type PL1: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
 a. Manufacturers:
- 1) Arborite: www.arborite.com/#sle.
- 2) Formica Corporation: www.formica.com/#sle.
- 3) Lamin-Art, Inc: www.laminart.com/#sle.
- 4) Panolam Industries International, Inc: www.panolam.com/#sle.
- 5) Wilsonart: www.wilsonart.com/#sle.
- b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
- c. Laminate Core Color: Same as decorative surface.
- d. Finish: Matte or suede, gloss rating of 5 to 20.
- e. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.
- 2. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inch thick; covered with matching laminate.
- 3. Back and End Splashes: Same material, same construction.
- 4. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 Countertops, Custom Grade.
- C. Solid Surface Window Sills: Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Flat Sheet Thickness: 1/2 inch, minimum.
 - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Avonite Surfaces: www.avonitesurfaces.com/#sle.
 - 2) Dupont: www.corian.com/#sle.
 - 3) Formica Corporation: www.formica.com/#sle.
 - 4) Wilsonart: www.wilsonart.com/#sle.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - d. Color and Pattern: As selected by Architect from manufacturer's full line.
 - 3. Other Components Thickness: 1/2 inch, minimum.

2.02 MATERIALS

- A. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.
- B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- D. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 ACCESSORIES

- A. Fixed Top-Mounted Countertop Support Brackets-Hidden:
 - 1. Material: Steel.
 - 2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
 - 3. Color: Black.
 - 4. Products:
 - a. Centerline Brackets; Front Mounting Countertop Support: www.countertopbracket.com/#sle.
 - b. Rangine Corporation; Rakks EH-Inside Wall Mount Series EH-1824FM; www.rakks.com.

2.04 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.

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- 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
- 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

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

END OF SECTION

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SECTION 21 0100 BASIC FIRE PROTECTION REQUIREMENTS

PART1- GENERAL

1.1 RELATED DOCUMENTS

- A. Basic Requirements: Requirements of the Contract Forms, Conditions of the Contract, Specifications, Drawings, and Addenda and Contract Modifications (the Contract Documents), apply to the requirements of each Section of Division 23.
- B. Conflicts: Nothing contained in this Section shall be construed to conflict in any way with other provisions or requirements of the Contract documents. The intent is that this Section will take precedence. Where differences arise, the Architect shall decide which directions or instructions take precedence.

1.2 SUMMARY

A. General: Unless an item is specifically mentioned as being provided by others, the requirements of Division 23 Contract Documents shall be completed. The systems, equipment, devices and accessories shall be installed, finished, tested and adjusted for continuous and proper operation. Any apparatus, material or device not shown on the Drawings but mentioned in these Specifications, or vice versa, or any incidental accessories necessary to make the project complete and operational in all respects, shall be furnished, delivered and installed without additional expense to the Owner. Include all materials, equipment, supervision, operation, methods and labor for the fabrication, installation, start-up and tests necessary for complete and properly functioning systems.

1.3 APPLICABLE STANDARDS

- A. Code Compliance: Refer to Division 1. As a minimum, unless otherwise indicated, comply with all rules, regulations, standards, codes, ordinances and laws of local, state and federal governments and the amendments and interpretation of such rules, regulations, standards, codes, ordinances and laws of local, state and federal governments by the authorities having lawful jurisdiction.
- B. ADA: Comply with the requirements of the Americans with Disabilities Act (ADA).
- C. Comply: With the National Fire Protection Association (NFPA) Standards and other Codes and Standards as adopted by the Local Authority having Jurisdiction.
- D. Florida Building Code 2020 Edition: Conform in strict compliance to the Florida Building Code (FBC) and the amendments which are enforced by the local authority having jurisdiction.
 - 1. Florida Building Code Mechanical 2020 Edition
 - 2. Florida Building Code Plumbing 2020 Edition
 - 3. Florida Building Code Chapter 13 Florida Energy Efficiency for Building Construction 2020 Edition
 - 4. FGI Guidelines for Design and Construction of Healthcare Facilities, 2018 Edition
- E. NATIONAL FIRE PROTECTION (NFPA) Standards:
 - 1. NFPA 1 Uniform Fire Code, 2018 Edition
 - 2. NFPA-10, Standard for Portable Fire Extinguishers, 2018 Edition

- 3. NFPA-13, Standard for the Installation of Sprinkler Systems, 2016 Edition
- 4. NFPA-14, Standard for the Installation of Standpipe and Hose Systems, 2016 Edition
- 5. NFPA-17, Standard for Dry-Chemical Extinguishing Systems, 2017 Edition
- 6. NFPA-20, Standard for the Installation of Stationary Pumps for Fire Protection, 2016 Edition
- 7. NFPA-24, Standards for the Installation of Private Fire Service Mains and Their Appurtenances, 2016 Edition
- 8. NFPA-30, Flammable and Combustible Liquids Code, 2018 Edition
- 9. NFPA-54, National Fuel Gas Code, 2018 Edition
- 10. NFPA-70, National Electrical Code, 2017 Edition
- 11. NFPA-72, National Fire Alarm Code, 2016 Edition
- 12. NFPA-90A, Standard for the Installation of Air Conditioning and Ventilation Systems, 2018 Edition
- 13. NFPA-90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems, 2018 Edition
- 14. NFPA-99, Standard for Health Care Facilities, 2018 Edition
- 15. NFPA-101, Life Safety Code, 2018 Edition
- 16. NFPA-704, Standard System for the Identification of the Fire Hazards of Materials for Emergency Response, 2017 Edition
- 17. NFPA-780, Installation of Lightning Protection Systems, 2017 Edition
- 18. NFPA-1963, Standard for Fire Hose Connections, 2014 Edition
- 19. NFPA-2001, Standard on Clean Agent Fire Extinguishing Systems, 2015 Edition
- F. Notification: Comply with all of the requirements of the Federal "Right-To-Know" Regulations and the Florida "Right-To-Know" Law and provide notification to all parties concerned as to the use of toxic substances.

1.4 DRAWINGS AND SPECIFICATIONS

- A. Intent: The intent of the drawings and specifications is to establish minimum acceptable quality standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.
- B. Equipment Placement: The drawings are diagrammatic, intended to show general arrangement, capacity and location of various components, equipment and devices. Each location shall be determined by reference to the general building plans and by actual measurements in the building as built. Reasonable changes in locations ordered by the Architect prior to the performance of the affected Work shall be provided at no additional cost to the Owner.
- C. Drawing Scale: Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets, transitions and fittings may not be shown but shall be provided at no additional cost.
- D. Conflict: In the event of a conflict, the Architect will render an interpretation in accordance with the General Conditions.

1.5 DEFINITIONS

A. Provide/Install: The word "provide" shall mean furnish, install, connect, test, complete, and leave ready for operation. The word "install" where used in conjunction with equipment furnished by the Owner or under another contract shall mean mount, connect, complete, and leave ready for operation.

- B. Concealed: The surface of insulated or non-insulated piping, ductwork or equipment is concealed from view when standing inside a finished room, such as inside a chase or above a ceiling.
- C. Exposed: The surface of insulated or non-insulated piping, ductwork or equipment is seen from inside a finished room, such as inside an equipment or air handling unit room.
- D. Protected: The surface of insulated or non-insulated piping, ductwork or equipment on the exterior of the building but protected from direct exposure to rain by an overhang, eave, in an unconditioned parking garage or building crawl space.
- E. Unprotected: The surface of insulated or non-insulated piping, ductwork or equipment on the exterior of the building and exposed to rain.
- F. Abbreviations: Abbreviations, where not defined in the Contract Documents, shall be interpreted to mean the normal construction industry terminology, as determined by the Architect. Plural words shall be interpreted as singular and singular words shall be interpreted as plural where applicable for context of the Contract Documents.

1.6 SHOP DRAWINGS

- A. General: Refer to paragraph entitled "SUBMITTAL" in this section. Include the following data:
 - 1. Shop Drawings:
 - a. Submit shop drawings for the following:
 - (1) Each Piping System
 - (2) Coordination Drawings

1.7 RECORD DRAWINGS

- A. Production: Maintain one set of black or blue line on white project record "as-built" drawings at the site. At all times the set shall be accurate, clear, and complete, indicating the actual installation. Record drawings shall be updated weekly to record the present stage of progress. These drawings shall be available to the Architect at all times. Equipment schedules, control diagrams, sequences of operation shall also be updated.
- B. Completion: Prior to substantial completion, transfer onto an unmarked second set of drawings all changes, marked in colored pencil, and submit them to the Architect. Upon completion of all punch lists, transfer all "As-Built" conditions to the Revit drawing files, package three (3) print sets of full size drawings of the Revit drawing files with associated reference files and submit them to the Architect for review and approval.

1.8 SUBMITTAL

- A. General: The provisions of this section are supplemental to the requirements in Division 1, and only apply to the material and equipment covered in Division 23.
- B. Time: Submit manufacturer's literature, performance data and installation instructions covered in each Section of Division 23 under an individual letter of transmittal within 30 days after Notice to Proceed unless otherwise indicated.

- C. Submitter's Review: All items required for each section shall be reviewed before submittal. Submittal information for each item shall bear a review stamp of approval, indicating the name of the Contractor and Subcontractor (where applicable), the material suppliers, the initials of submitter and date checked. Responsibility for errors or omissions in submittals shall not be relieved by the Architect's review of submittals. Responsibility for submittals cannot be subrogated to material suppliers by Contractors or Subcontractors.
 - 1. Review of the submittal data, whether indicated with "APPROVED" or with review comments, does not constitute authorization for or acceptance of a change in the contract price.
- D. Architect's Review: The submittal data shall be reviewed only for general conformance with the design concept of the project and for general compliance with the Contract Documents. Any action indicated is subject to the requirements of the Contract Documents. Reviews of submittal data review shall not include quantities; dimensions (which shall be confirmed and correlated at the job site); fabrication processes; techniques of construction; and co-ordination of the submittal data with all other trades. Copies of the submittal data will be returned marked "<u>ACCEPTED AS SUBMITTED</u>", "ACCEPTED AS NOTED", "REVISED AS NOTED AND RESUBMIT", "REJECTED, REVISED AS NOTED AND RESUBMIT".
- E. Submittal Items: Submittal items shall be inserted in a Technical Information Brochure. Mark the appropriate specification section or drawing reference number in the right hand corner of each item. All typewritten pages shall be on the product or equipment manufacturer's printed letterhead.
 - 1. Manufacturer's Literature: Where indicated, include the manufacturer's printed literature. Literature shall be clearly marked to indicate the item intended for use.
 - 2. Performance Data: Provide performance data, wiring and control diagrams and scale drawings which show that proposed equipment will fit into allotted space (indicate areas required for service access, connections, etc.), and other data required for the Architect to determine that the equipment complies with the Contract Documents. Where noted, performance data shall be certified by the manufacturer at the design rating points.
 - 3. Installation Instructions: Where requested, each product submittal shall include the manufacturer's installation instructions. Generic installation instructions are not acceptable. Instructions shall be the same as those included with the product when it is shipped from the factory.
 - 4. Written Operating Instructions: Instructions shall be the manufacturer's written operating instructions for the specified product. If the instructions cover more than one model or type of product they shall be clearly marked to identify the instructions that cover the product delivered to the project. Operating Instructions shall be submitted immediately after the product or equipment submittal has been returned from the Architect marked "APPROVED" or "APPROVED AS NOTED".
 - 5. Maintenance Instructions: Information shall be the manufacturer's printed instructions and parts lists for the equipment furnished. If the instructions cover more than one model or type of equipment they shall be marked to identify the instructions for the furnished product. Submit maintenance instructions immediately after the product or equipment submittal has been returned from the Architect marked "APPROVED" or "APPROVED AS NOTED".

F. Substitutions:

- General: Refer to Division 1. Substitutions may be considered for any product or equipment of a manufacturer. See paragraph entitled "MANUFACTURER" in this Section. Any product or equipment may be submitted for review; however, only one substitution per item will be considered. If a substituted product or equipment item is rejected, provide the specified product or equipment.
 - a. Submittal shall include the name of the material or equipment to be substituted, equipment model numbers, drawings, catalog cuts, performance and test data and any other data or information necessary for the Architect to determine that the equipment meets the specification requirements. If the Architect accepts any proposed substitutions, such acceptance will be set forth in writing.
 - b. Substituted equipment with all accessories installed or optional equipment where permitted and found acceptable, must conform to space requirements. Substituted equipment that cannot meet space requirements, whether accepted or not, shall be replaced at no additional expense to the Owner. If the substituted item affects the work of other trades, the Request for Substitution form shall include a list of the necessary modifications.
- 2. Deviations: The Request for Substitution form shall include a complete list of deviations from the scheduled item stating both the features and functions of the scheduled item and the comparable features and functions of the proposed substitution.
 - a. Any deviation not indicated in writing will be assumed to be identical to the specified item even if it is shown otherwise on the submittal data.
 - b. If a deviation not listed is found any time after review and acceptance by the Architect and that deviation, in the opinion of the Architect, renders the substituted item as unacceptable, the item shall be removed and replaced by the scheduled item at no additional cost to the Owner.
 - c. The Architect shall retain the right to specify modifications to the substituted item, correcting or adjusting for the deviation, if the Architect deems it to be in the best interest of the Owner.
- 3. Scheduled Item: A scheduled item is a product or item of equipment indicated in the Contract Documents by manufacturer's name and model number identifying a single item. The manufacturer's trade name for a group of products that does not signify a single item including type, style, quality, performance, and sound rating shall not be classified as a scheduled item. Where more than one manufacturer and product model number are indicated, each shall be considered as a scheduled item.
- 4. Form: When a product or item of equipment is proposed as a substitution a "REQUEST FOR SUBSTITUTION" form shall be completed and submitted with the required data. A copy of the form is included after the end of this section.
- 5. Rejection: Substituted products or equipment will be rejected if, in the opinion of the Architect, the submittal does not meet any one of the following conditions or requirements:
 - a. The submittal data is insufficient or not clearly identified. The Architect may or may not request additional information.

- b. The product or equipment will not fit the space available and still provide the manufacturers published service area requirements.
- c. The product or equipment submitted is not equivalent to or better than the specified item. Products or equipment of lesser quality may be considered provided an equitable financial rebate, satisfactory to the Architect, is to be returned to the Owner.
- d. The product or equipment submitted has less capacity, efficiency and safety provisions than the specified item.
- e. The product or equipment submitted does not have warranty, service and factory representation equivalent to that specified.
- f. The Owner prefers not to accept the submitted product.
- G. Technical Information Brochure:
 - Binder: Include binders with the first submittal for the Technical Information Brochure. Each binder shall be size 3 inch, hardcover, 3-ring type for 8-1/2" X 11" sheets. Provide correct designation on outside cover and on spine of each binder, i.e., MECHANICAL SUBMITTAL DATA, MECHANICAL OPERATION INSTRUCTION and MECHANICAL MAINTENANCE INSTRUCTIONS.
 - 2. Number: Submit not less than five sets of binders for each of the three mechanical brochures indicated above. Each set shall consist of a minimum of two binders for submittal data and 1 binder each for operating instructions and for maintenance instructions. Additional binders shall be submitted at the request of the Architect. One set of binders shall be retained by the Architect. Three sets of binders shall be maintained for the Owner and the remaining set shall become the property of the Engineer.
 - 3. Index: First sheet in each brochure shall be a photocopy of the "Division 23 Index" of the specifications. Second sheet shall list the firm name, address, phone number, superintendent's name for the contractor and all major subcontractors and suppliers associated with the project.
 - 4. Dividers: Provide reinforced separation sheets tabbed with the appropriate specifications Section reference number for each Section in which submittal data or operation and maintenance instructions is required.
 - 5. Specifications: Insert a copy of the specifications for each Section and all addenda applicable to the Section between each of the Section dividers.

1.9 SHOP DRAWINGS FOR PIPING SYSTEMS

- A. Requirements: Make Shop Drawings for piping systems at a minimum scale of 1/4 inch per foot in Revit and print on reproducible transparencies to verify clearances and equipment locations. Show required maintenance and operational clearances. Identify Shop Drawings by project name and include names of Architect, Engineer, Contractors, Subcontractors and supplier, date in Shop Drawing title block. Number drawings sequentially and indicate:
 - 1. Architectural and structural backgrounds with room names and numbers, etc., including but not limited to plans, sections, elevations, details, etc.
 - 2. Fabrication and erection dimensions.
 - 3. Arrangements and sectional views.
 - 4. Necessary details, including complete information for making connections to equipment.

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- 5. Descriptive names of equipment.
- 6. Modifications and options to standard equipment required by Contract Documents.
- B. Stamp Area: Leave 4 inch by 2-1/2 inch blank area near title block for Architect's shop drawing stamp. The acceptance of a shop drawing by indicating "APPROVED" does not relieve the contractor from full compliance with the sizes and equipment connections shown on the contract documents unless the changes are specifically indicated on the shop drawing.
- C. Reference Key: Indicate by cross-reference the Contract Drawings, notes, or Specification paragraph numbers where item(s) occur in the Contract Documents.
- D. Additional Requirements: See specific Sections for additional requirements.

1.10 COORDINATION DRAWINGS

- A. General: Provide detailed (minimum 1/4 inch per foot) scaled coordination drawings showing locations and positions of all architectural, structural, (FF&E) equipment, electrical, plumbing, fire protection and mechanical elements for all installations. Provide overlay drawings, prior to beginning work, indicating work in and above ceilings and in mechanical and electrical rooms with horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions and other services. Accommodate phasing and temporary conditions indicated on the contract drawings as necessary to complete the work without disruption to the Owner's use of the existing occupied areas of the building(s).
- B. Coordination of Space: Coordinate use of project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on drawings. Follow routings shown for pipes, ducts and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- C. In finished areas except as otherwise shown, conceal pipes, ducts, and wiring in construction. Coordinate locations of fixtures and outlets with finish elements. Contractor shall provide background drawings showing partitions, ceiling heights, and structural framing locations and elevations, and existing obstructions. Contractor shall resolve major interferences at initial coordination meeting prior to production of coordination drawings.
- D. Precedence of Services: In event of conflicts and interferences involving location and layout of work, use the following priority to resolve interferences:
 - 1. Structure has highest priority.
 - 2. Walls systems.
 - 3. Ceiling grid/light fixtures.
 - 4. Gravity drainage lines.
 - 5. Large pipe mains.
 - 6. Ductwork/diffusers, registers and grilles.
 - 7. Sprinkler heads.
 - 8. Small piping and tubing/electrical conduit.
 - 9. Access panels.
- E. Drawings shall be developed on Revit and utilize AIA Standard layering conventions. At the completion of the project construction, the Contractor shall provide two (2) full-sized

print sets and two (2) CDs of all drawing files with related reference files representing asbuilt installations for Architect review. Upon approval that the submitted information is complete, a similar submittal shall be provided to the Owner.

- F. Reference Key: Indicate by cross-reference the Contract Drawings, notes, or Specification paragraph numbers where item(s) occur in the Contract Documents.
- G. Additional Requirements: See specific Sections for additional requirements.

1.11 MANUFACTURER'S CHECKOUT

A. Start-up and Checkout: At completion of installation and prior to performance verification, a factory-trained representative of the manufacturer shall provide start-up and checkout service. After the performance verification the manufacturer's representative shall examine performance information and check the equipment in operation, and sign "Check-Out Memo" for the record. Submit a copy of Memo on each item of equipment where indicated in individual sections of these specifications for inclusion in each Technical Information Brochure. The "Check-Out Memo" shall be included with the performance verification data. Do not request "Instruction in Operation Conference" or request final inspection until Memos have been submitted and found acceptable.

1.12 INSTRUCTION TO OWNER

- A. General: Instructions to the Owner shall be by competent representatives of the manufacturers involved, with time allowed for complete coverage of all operating procedures. Provide classroom instruction and field training in the design, operation and maintenance of the equipment and troubleshooting procedures. Explain the identification system, operational diagrams, emergency and alarm provisions, sequencing requirements, seasonal provisions, security, safety, efficiency and similar provisions of the systems. On the date of substantial completion, turn over the prime responsibility for operation of the mechanical equipment and systems to the Owner's operating personnel.
- B. Training Period: Unless otherwise indicated training periods shall encompass the following number of hours of classroom and hands-on instructions with a maximum period of 4 hours per day for either. Mixing classroom instructions and hands on training in the same day is unacceptable.
 - 1. Training Periods:
 - a. 8 hours Classroom
 - b. 8 hours Hands-on
- C. Scheduling: Submit any remaining required items for checking at least one week before final inspection of building. When submittal items are found acceptable, notify Owner, in writing that an "Instruction in Operation Conference" may precede. Conference will be scheduled by the Owner. After the conference, copies of a memo certifying that the "Instruction in Operation Conference" and "Completed Demonstration" have been made will be signed by Owner and the instructors, and one copy will be inserted in each Technical Information Brochure.

1.13 ALLOWANCES

A. General: Division 1.

1.14 ALTERNATES

A. Refer to Division 1.

1.15 STRUCTURAL CALCULATIONS FOR ROOF-MOUNTED EQUIPMENT

A. All roof-mounted devices, equipment and systems shall be constructed, designed and fastened to withstand wind loads of velocities up to 155 mph. Structural calculations for roof-mounted equipment shall be completed in accordance with Florida Building Code requirements and submitted by a structural engineer registered in the State of Florida.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified Products: Manufacturer's names and product model numbers indicated on the drawings and in these specifications establish the type, style, quality, performance, and sound rating of the desired product. Listing of other manufacturers indicates that their equivalent products would be acceptable if they meet the specification requirements, the specific use and installation shown on the drawings, including space and clearance requirements, and the energy consumption and efficiency of the specified product. The listing of additional manufacturers in no way indicates that the manufacturer can provide an acceptable product.
- B. Space Requirements: All manufactured products furnished on this project must have the required space and service areas indicated in the manufacturer's printed literature or shown on their shop drawing. When the manufacturer does not indicate the space required for servicing the equipment, the space shown on the drawings or as required by the Architect must be provided.

2.2 MATERIAL AND EQUIPMENT

- A. General: Material and equipment used shall be produced by manufacturers regularly engaged in the production of similar items, and with a history of satisfactory use as judged by the Architect.
- B. Specified Equipment: Equipment shall be the capacity and types indicated or shall be equivalent in the opinion of the Architect. Material and equipment furnished and installed shall be new, recently manufactured, of standard first grade quality and designed for the specific purpose. Equipment and material furnished shall be the manufacturer's standard item of production unless specified or required to be modified to suit job conditions. Sizes, material, finish, dimensions and the capacities for the specified application shall be published in catalogs for national distribution. Ratings and capacities shall be certified by a recognized rating bureau. Products shall be complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- C. Compatibility: Material and equipment of one and the same kind, type or classification and used for identical or similar purposes shall be made by the same manufacturer. Where more than one choice is available, select the options which are compatible with other products already selected. Compatibility is a basic general requirement of product selection.
- D. Coordination of Materials: In the event of multiple award packages for the completion of this work, the Contractor shall direct and lead the coordination effort necessary to ensure that all materials and equipment that have moving parts, are procured from the same

manufacturer and are the same model as consistent with its use and as required by these specifications.

- 1. The Contractor shall additionally ensure that the installation of this material and equipment is consistent for the Owner's use and maintenance, and shall effect necessary adjustments to render the installations consistent.
- 2. In the event of dispute, the earlier award package materials, as prescribed by approved submittal documents, shall take precedent in defining the material and equipment coordination requirements of the project.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. General: The installation of materials and equipment shall be done in a neat, workmanlike and timely manner by an adequate number of craftsmen knowledgeable of the requirements of the Contract Documents. They shall be skilled in the methods and craftsmanship needed to produce a first-quality installation. Personnel who install materials and equipment shall be qualified by training and experience to perform their assigned tasks. All materials and equipment shall be installed per the manufacturer's written requirements.
- B. Acceptable Workmanship: Acceptable workmanship is characterized by first-quality appearance and function which conforms to applicable standards of building system construction and exhibits a degree of quality and proficiency which is judged by the Architect equivalent as or better than that ordinarily produced by qualified industry tradesmen.
- C. Performance: Personnel shall not be used in the performance of the installation of material and equipment that, in the opinion of the Architect, are deemed to be careless or unqualified to perform the assigned tasks. Material and equipment installations not in compliance with the Contract Documents, or installed with substandard workmanship in the opinion of the Architect, shall be removed and reinstalled by qualified craftsmen at no change in the contract price.

3.2 CLEANING AND PROTECTION

- A. General: Refer to Division 1.
- B. Emergency Contacts: Prior to the beginning of the project, provide the Owner with a list of names, emergency telephone and beeper numbers of individuals who can be contacted during working and non-working hours, including weekends, for assistance throughout the warranty period if leaks, equipment failure or other damages occur. Update the list throughout installation and warranty to provide continuous availability of responsible parties to the Owner. If the Owner cannot contact the responsible party during an emergency situation, the Owner may effect emergency repairs through other means and may backcharge for the costs of repair material and labor incurred.
- C. Emergency Contacts: Along with the operating and maintenance manual submittal, provide the Owner with a list of the names and emergency telephone and beeper numbers of individuals who can be contacted during working and non-working hours, including weekends, for assistance throughout the warranty period should leaks, equipment failure or other damage occur. Update the list throughout warranty to provide continuous availability of responsible parties to the Owner. If the Owner cannot contact

Project No. 121505 Basic Fire Requirements Section 21 0100 - 10 the responsible party during an emergency situation, the Owner may affect emergency repairs through other means and may backcharge for the costs of repair material and labor incurred.

- D. Housekeeping: Keep interiors of duct and pipe systems clean and free from dirt, rubbish and foreign matter. Close open ends of piping and ductwork at all times throughout the installation. Install 30% efficient filter media over each return air grille and open return duct opening; change media regularly during construction when dirty to keep duct interiors clean. Prevent dust, debris and foreign material from entering the piping and ductwork.
- E. Equipment Protection: Protect fan motors, switches, equipment, fixtures, and other items from dirt, rubbish and foreign matter. Do not operate air-handling equipment if the building is not clean or if dust can enter the coils or the fan housings.
- F. Equipment Cleaning: Thoroughly clean equipment and entire piping systems internally upon completion of installation and immediately prior to final acceptance. Open dirt pockets and strainers, blow down each piping system and clean strainer screens of accumulated debris. Remove accumulated dirt, scale, oil and foreign substances. Thoroughly wipe clean internal surfaces of ductwork and air handling units prior to request for substantial completion. (See para. 3.2 above.)
- G. Building Cleanup: Remove debris, rubbish, leftover materials, tools and equipment from work areas and site. Clean tunnels and closed off spaces of packing boxes, wood frame members and other waste materials used in the installation. Final acceptance shall not be approved until site is cleaned.
- H. Fixture Cleanup: Remove temporary labels, stickers, etc., from fixtures and equipment. Do not remove permanent nameplates, equipment model numbers, ratings, etc.
- I. Filter Replacement: Provide filters, with the same efficiency rating as required for the final installation, for the protection of the air moving equipment and ductwork continuously throughout the construction phase. Provide a new set of clean filters for the test and balance of the air side equipment.
- J. Protection of Finished Installation: Where installation is required in areas previously finished by other trades, protect the area from marring, soiling or other damage.
- K. Air Handling Unit Operation During Construction Phase: Do not operate air handling equipment during building construction phase unless filter fabric is fastened to all duct systems' inlets and all specified and scheduled air filters are installed to minimize dirt entry into ductwork and air moving equipment. When running air handling units to dry out the building, control the building temperature to drop very slowly, and verify all HVAC insulation is completed and doors and windows are installed and closed, to prevent condensation of water from humid air on building interior surfaces, equipment, materials and ductwork.

3.3 CORRECTION OF WORK

A. General: At no additional cost to the Owner, rectify discrepancies between the actual installation and contract documents when in the opinion of the T&B Agency or the Architect the discrepancies will affect system balance and performance.

B. Drive Changes: Include the cost of all pulley, belt, and drive changes, as well as balancing dampers, valves and fittings, and access panels to achieve proper system balance recommended by the T&B Agency.

3.4 COORDINATION AND ASSISTANCE

- A. General: Provide all labor, equipment, tools and material required to operate the equipment and systems necessary for the acceptable testing of the systems and for the adjustment, calibration or repair of all electric or pneumatic automated control devices and components. These services shall be available on each working day during the period of final testing and balancing.
- B. Drawings and Specifications: Provide to the Authority having Jurisdiction a complete set of project record drawings and specifications and an approved copy of all approved shop drawings and equipment submittals. The Authority having Jurisdiction shall be informed of all changes made to the system during construction, including applicable change orders.
- C. Coordination: Coordinate the work of all trades and equipment suppliers to complete the modifications recommended by the Authority having Jurisdiction and accepted by the Architect. Cut or drill holes for the insertion of measuring devices as directed for test purposes; repair to as-new condition, inserting caps or covers to prevent leakage.

3.5 PREPARATIONS FOR PERFORMANCE VERIFICATION

- A. Verification: Prior to commencement of the balancing by the T&B Agency, the Contractor shall verify in writing:
 - 1. That strainers have been removed, cleaned and replaced, and that temporary construction strainers have been removed.
 - 2. That air vents at high points of the piping systems have been inspected and installed and operating freely.
 - 3. That automatic valves, hand valves, and balancing valves have been placed in a fixed open position for full flow through all devices.
 - 4. That linkages between valves and their actuators are secure, non-overloading and non-binding.
 - 5. That pressures for hydronic reducing valves have been set.
 - 6. That pumps are operating at the correct rotation and specified horsepower.
 - 7. That piping has been pressure tested and accepted and piping systems have been cleaned, flushed, sterilized and refilled with chemicals and prescribed treated water and vented.
 - 8. That operating temperatures and pressures have been set for pressure regulating valves, etc.
 - 9. That the operating safeties (thermal overloads, firestat/freezestats, smoke detectors, relief valves, etc.), are installed and fully functional.
 - 10. That equipment has been lubricated and can be operated without damage.

- 11. That the systems are operational and complete.
- 12. That no latent residual work remains to be completed.

3.6 ACCEPTANCE TESTING PROCEDURE

- A. General: Each fire protection system shall be tested to confirm proper operation and function in accordance with the construction documents and sequence of operations.
- B. The enclosed checklists shall be completed for each system and signed off by the fire protection sub-contractor project representative, then verified and signed-off by the construction manager systems engineer. All checklists shall be incorporated into the project's close-out manuals submitted for Owner record.
- C. On-site testing by the Architect and Engineer shall be performed at the discretion of the Architect/Engineer for any or all systems to confirm test results and system function.
- D. The Contractor is responsible to provide adequate time in the completion of the construction to perform these system tests prior to the AHCA final inspections in the affected areas/systems.
- E. The Contractor is responsible for ensuring all required system tests are conducted successfully and recording associated test data and results, in accordance with NFPA 13 and NFPA 20.
- F. The Contractor is responsible for contacting the Authority having Jurisdiction, Architect and Engineer at least two weeks prior to system test availability and schedule acceptable to Architect/Engineer for on-site testing.
- G. If, in the Architect's and Engineer's opinion, the test results indicate that the systems' installation is not adequately complete for testing, the testing shall be re-scheduled and the Contractor shall be responsible to prepare for such re-test.
- H. Prior to Owner occupancy, all system testing shall be completed and approved.

3.7 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Replacement of Damaged Stored Material and Equipment: Any material and equipment that has been wet or otherwise damaged prior to installation, in the opinion of the Architect, shall be replaced with new material regardless of the condition of the material and equipment at the time of installation.
- B. Repair of Damaged Installed Material and Equipment: After installation correct or repair dents, scratches and other visible blemishes. At the direction of Architect replace or repair to "as new" condition equipment which has been damaged during construction.
- C. During construction, all piping system openings shall be capped with at least two layers of polyethylene film, fastened tightly in place with banding material or foil tape until connection of the continuation of such piping or ductwork is occurring.
- D. All air diffusers serving critical care areas shall be disinfected per owner infection control guidelines with a commercial germicide complying with EPA regulations utilizing per manufacturer use standards prior to building occupancy.

3.8 COORDINATION OF SERVICES

- A. General: Where phasing of the work requires partial occupancy, coordinate interruption of services to Owner-occupied areas in writing in advance with the Architect. Shutdown time and duration of services interruption shall be decided by the Owner. Provide shutoff valves at points of interconnection to minimize downtime. Procedures incidental to the outage shall be prepared in advance to minimize downtime.
- B. General: Coordinate interruption of services in writing at least 1 week in advance with the Architect. Shutdown time and duration of services interruption shall be decided by the Owner. Provide shutoff valves at points of interconnection to minimize downtime. Procedures incidental to the outage shall be prepared in advance to minimize downtime.
- C. Protection of Facilities: Portions of the building may be operational during construction. Maintain operation of the equipment and systems whenever the installation interfaces with equipment or systems. Provide protection for the building, its contents and occupants wherever installation under the contract is performed. As necessary, move, store, and protect furniture, office fixtures and carpets. Access to the building, including exit stairs, doors and passageways, and loading dock and other delivery areas shall be kept open and continuously accessible to the occupants. Workmen shall be confined to those areas directly involved in the project installation, and only during time periods indicated and approved by the Owner.

3.9 PAINTING OF MECHANICAL PIPING

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual".
 - 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.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple costs of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional costs until cured file has a uniform paint finish, color, and appearance.
- A. 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.
- B. Painting Fire Protection work:
 - 1. Paint the following work where exposed in Equipment Rooms:

- a. Uninsulated metal piping.
- 2. Paint the following work where exposed in Occupied Spaces:
 - Uninsulated metal piping.
 - Pipe hangers and supports.

3.10 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
- B. Contractor shall touch up and restore painted surfaces damaged by testing.
- C. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.11 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.

END OF DOCUMENT 21 0100

REQUEST FOR SUBSTITUTION (Must be Submitted Prior to Bid)

Project Name:	Location:	
Project Name.	LOCAIION	

Date of Request: _____

Name of Party Requesting Substitute:

Reason for Substitution Request:

Drawing	Spec. Sect. No.	Paragraph	Specified Item	Manu	Model
Proposed Sub	ostitute:				
Manufacturer	and Model Number:				

Deviations from the Specified Item: (See paragraph entitled "Deviations".)

Reason for Substitution:

Changes to Other Systems to Permit Use of Proposed Substitute: (List changes. Submit drawings if required for clarity.)

Technical Data to Support Request for Acceptance: (List ASTM or other standards designations, testing laboratory reports, experience records, etc.)

Other Supporting Data: (Submit brochures, samples, drawings, etc.)

REQUEST FOR SUBSTITUTION (Continued)

<u>Certification</u>: In making request for substitution, the party whose authorized signature appears below, certifies that all of the following statements are correct and are accepted without exception:

The proposed substitution has been personally investigated and is equal or superior in all significant respects to the product specified for the specific applications required;

The proposed substitution will be warranted under the same terms required for the specified product;

Coordination aspects necessitated by the proposed substitution will be accomplished in a complete and proper fashion by the party signing this form without any additional cost to the Owner; and

Claims against the Owner for additional costs related to the proposed substitution which subsequently become apparent after acceptance by the Architect are hereby waived.

<u>Credit:</u> If this substitution is acceptable the following credit shall be given to the Owner;

\$_____

CERTIFICATION OF EQUIVALENT PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUIVALENT PERFORMANCE

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

Submitted by: _____

Signature

Title

Typed Name: _____

Company: _____

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide a legally binding signature will invalidate this request.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Mechanical sleeve seals.
 - 3. Sleeves.
 - 4. Escutcheons.
 - 5. Grout.
 - 6. Fire-suppression equipment and piping demolition.
 - 7. Equipment installation requirements common to equipment sections.
 - 8. Painting and finishing.
 - 9. Concrete bases.
 - 10. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Mechanical sleeve seals.
 - 2. Escutcheons.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

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

2.3 JOINING MATERIALS

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- A. Refer to individual Division 21 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and fullface or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solid Filler Metals: ASTM B-32, lead-free alloys. Include water flushable flux according to ASTM B 813.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Carbon steel or Stainless steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

- C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- D. PVC Pipe: ASTM D 1785, Schedule 40.

2.6 PIPING ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- C. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.
- D. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.
- E. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Equipment to Be Removed: Disconnect and cap services and remove equipment.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Bare Piping at Wall Ceiling and Floor Penetrations in Finished Spaces: Onepiece, cast-brass type with polished chrome-plated finish.
- M. Permanent sleeves are not required for holes formed by removable PE sleeves.
- N. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

- a. Steel Pipe Sleeves.
- Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with grout.
- 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- O. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- P. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- Q. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.
- R. Verify final equipment locations for roughing-in.
- S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

- D. Soldered Joints: Apply ASTM B 813, water flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook", using lead free solder alloy complying with ASTM B 32.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4 PAINTING

- A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Concrete Bases: Shall be coordinated with Division 03.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.7 GROUTING

- A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.

- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF DOCUMENT 21 0500

SECTION 21 0548 VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Elastomeric isolation pads.
- 2. Elastomeric isolation mounts.
- 3. Restrained elastomeric isolation mounts.
- 4. Elastomeric hangers.
- 5. Snubbers.
- 6. Restraints rigid type.
- 7. Restraints cable type.
- 8. Restraint accessories.
- 9. Post-installed concrete anchors.
- 10. Concrete inserts.
- B. Related Requirements:
 - 1. Section 22 0548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for devices for plumbing equipment and systems.
 - 2. Section 23 0548 "Vibration and Seismic Controls for HVAC" for devices for HVAC equipment and systems.

1.3 **DEFINITIONS**

- A. Designated Seismic System: A fire-suppression component that requires design in accordance with ASCE/SEI 7, Ch. 13 and for which the Component Importance Factor is greater than 1.0.
- B. IBC: International Building Code.
- C. OSHPD: Office of Statewide Health Planning and Development (for the State of California).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
 - 2. Include load rating for each wind-load-restraint fitting and assembly.
 - 3. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-[and wind-load-]restraint component.

- Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by [ICC-ES product listing] [UL product listing] [FM Approvals] [an evaluation service member of ICC-ES] [OSHPD] [an agency acceptable to authorities having jurisdiction].
- 5. Annotate to indicate application of each product submitted and compliance with requirements.
- 6. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.
- B. Shop Drawings:
 - 1. Detail fabrication and assembly of equipment bases.
 - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
- C. Delegated-Design Submittal:
 - 1. For each seismic-restraint [and] [wind-load protection] device, including [seismic-restrained mounting,] [pipe-riser resilient support,] [snubber,] [seismic restraint,] [seismic-restraint accessory,] [and] [concrete anchor and insert] that is required by this Section or is indicated on Drawings, submit the following:
 - a. Seismic-[and Wind-Load-]Restraint Selection: Select seismic [and windload]restraints complying with performance requirements, design criteria, and analysis data.
 - b. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and seismic loads. Include certification by professional engineer that riser system was examined for excessive stress and that none exists.
 - c. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic[**and wind**] loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
 - d. Seismic Design Calculations: Submit all input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.
 - e. Wind-Load Design Calculations: Submit all static and dynamic loading calculations prepared under "Wind-Load Design Calculations" in "Performance Requirements" Article.
 - f. Qualified Professional Engineer: All designated-design submittals for seismic [and wind-load-restraint]calculations are to be signed and sealed by qualified professional engineer responsible for their preparation.
 - 2. Seismic-[and Wind-Load-]Restraint Detail Drawing:
 - a. Design Analysis: To support selection and arrangement of seismic[and wind] restraints. Include calculations of combined tensile and shear loads.
 - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
 - c. Coordinate seismic restraint details with wind-load restraint details required for equipment mounted outdoors. Comply also with requirements in other Sections for equipment mounted outdoors.
 - 3. Product Listing, Preapproval, and Evaluation Documentation: By [an evaluation service member of ICC-ES] [UL] [FM Approvals] [OSHPD] [an agency acceptable to authorities having jurisdiction], showing maximum ratings of restraint items and the basis for approval (tests or calculations).

- 4. All delegated-design submittals for seismic-[and wind-load-]restraint detail Drawings are to be signed and sealed by qualified professional engineer responsible for their preparation.
- D. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, and seismic loads. Include certification that riser system was examined for excessive stress and that none exists.

1.5 **INFORMATIONAL SUBMITTALS**

- Coordination Drawings: Show coordination of seismic bracing for fire-suppression piping and Α. equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- Β. Qualification Data: For [professional engineer] [and] [testing agency].
- C. Welding certificates.
- D. Field quality-control reports.
- E. Seismic Qualification Data: Provide special certification for designated seismic systems as indicated in [ASCE/SEI 7-05,] [ASCE/SEI 7-10,] [ASCE/SEI 7-16,] Paragraph 13.2.2, "Special Certification Requirements for Designated Seismic Systems" for all Designated Seismic Systems identified as such on Drawings or in the Specifications.
 - Provide equipment manufacturer's written certification for each designated active fire-1. suppression system seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7 and AHRI 1270 (AHRI 1271), including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction [or] [experience data as permitted by] [ASCE/SEI 7-05] [ASCE/SEI 7-10] [ASCE/SEI 7-16].
 - 2. Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in [ASCE/SEI 7-05] [ASCE/SEI 7-10] [ASCE/SEI 7-16].
 - 3. Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by a licensed professional engineer.
 - The following fire-suppression system systems and components are Designated Seismic 4. Systems and require written special certification of seismic qualification by manufacturer: <Insert list>. a.
- F. Wind-Load Performance Certification: Provide special certification for fire-suppression system components subject to high-wind exposure and impact damage and designated on Drawings or in the Specifications to require wind-load performance certification.
 - 1. Provide equipment manufacturer's written certification for each designated firesuppression system device, stating that it will remain in place and operable following the design wind event and comply with all requirements of authorities having jurisdiction.
 - 2. Certification must be based on ICC-ES or similar nationally recognized testing standard procedures acceptable to authorities having jurisdiction
 - 3. The following fire-suppression system systems and components require special certification for high wind performance. Written special certification of resistance to the effects of high wind load and impact damage must be provided by manufacturer. <Insert list>.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- C. Seismic-[and Wind-Load-]Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public. Provide third-party listing by one or more of the following: [ICC-ES product listing] [UL product listing] [FM Approvals] [an evaluation service member of ICC-ES] [an agency acceptable to authorities having jurisdiction].

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design seismic[**and wind-load**] control system.
 - 1. Seismic Performance: Equipment must be designed and secured to withstand the effects of earthquake motions determined in accordance with NFPA 13 and [ASCE/SEI 7-05] [ASCE/SEI 7-10] [ASCE/SEI 7-16] < Insert requirement >.
 - 2. Wind-Load Performance: Equipment must be designed and secured to withstand the effects of high wind events determined in accordance with [ASCE/SEI 7-05] [ASCE/SEI 7-10] [ASCE/SEI 7-16] < Insert requirement >.
- B. Seismic Design Calculations:
 - 1. Perform calculations to obtain force information necessary to properly select seismic-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in [NFPA 13] [and] [ASCE/SEI 7-05] [ASCE/SEI 7-10 including supplement No. 1] [ASCE/SEI 7-16] <Insert ASCE/SEI 7 edition or other seismic calculation method required by authorities having jurisdiction>. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is the edition intended as reference throughout the Section Text.
 - a. Data indicated below to be determined by Delegated-Design Contractor must be obtained by Contractor and must be included in individual component submittal packages.
 - b. Coordinate seismic design calculations with wind-load calculations for equipment mounted outdoors. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.
 - c. Building Occupancy Category: [I] [II] [III] [IV].
 - d. Building Risk Category: [I] [II] [III] [IV].
 - e. Building Site Classification: [A] [B] [C] [D] [E] [F].
 - Calculation Factors, ASCE/SEI 7-16, Ch. 13 Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-16 unless otherwise noted.
 - a. Horizontal Seismic Design Force F_p: Value is to be calculated by Delegated-Design Contractor using Equation 13.3-1. Factors below must be obtained for this calculation.

- 1) S_{DS} = Spectral Acceleration: <**Insert value>**. Value applies to all components on Project.
- 2) a_p = Component Amplification Factor: See Drawing Schedule for each component.
- 3) I_p = Component Importance Factor: See Drawing Schedule for each component.
- 4) W_p = Component Operating Weight: For each component. Obtain by Delegated-Design Contractor from each component submittal.
- 5) R_p = Component Response Modification Factor: See Drawing Schedule for each component.
- 6) z = Height in Structure of Point of Attachment of Component for Base: Determine from Project Drawings for each component by Delegated-Design Contractor. For items at or below the base, "z" shall be taken as zero.
- 7) h = Average Roof Height of Structure for Base: Determine from Project Drawings by Delegated-Design Contractor.
- b. Vertical Seismic Design Force: Calculated by Delegated-Design Contractor using method explained in ASCE/SEI 7-16, Paragraph 13.3.1.2.
- c. Seismic Relative Displacement D_{pl}: Calculated by Delegated-Design Contractor using methods explained in ASCE/SEI 7-16, Paragraph 13.3.2. Factors below must be obtained for this calculation:
 - D_p = Relative Seismic Displacement that Each Component Must Be Designed to Accommodate: Calculated by Delegated-Design Contractor in accordance with ASCE/SEI 7-16, Paragraph 13.3.2.
 - 2) I_e = Structure Importance Factor: <**Insert value**>. Value applies to all components on Project.
 - 3) δ_{xA} = Deflection at Building Level x of Structure A: See Drawing Schedule for each component.
 - 4) δ_{yA} = Deflection at Building Level y of Structure A: See Drawing Schedule for each component.
 - 5) δ_{yB} = Deflection at Building Level y of Structure B: See Drawing Schedule for each component.
 - 6) h_x = Height of Level x to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
 - 7) h_y = Height of Level y to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
 - 8) Δ_{aA} = Allowable Story Drift for Structure A: See Drawing Schedules for each component.
 - 9) Δ_{aB} = Allowable Story Drift for Structure B: See Drawing Schedules for each component.
 - 10) h_{sx} = Story Height Used in the Definition of the Allowable Drift Δ_a : See Drawings Schedules for each component.
- d. Component Fundamental Period T_p: Calculated by Delegated-Design Contractor using methods explained in ASCE/SEI 7-16, Paragraph 13.3.3. Factors below must be obtained for this calculation:
 - W_p = Component Operating Weight: Determined by contractor from Project Drawings and manufacturer's data.
 - 2) g = Gravitational Acceleration: [32.17 fps² (9.81 m/s²)] <Insert option>.
 - K_p = Combined Stiffness of Component, Supports, and Attachments: Determined by delegated-design seismic engineer. <Insert value>.
- 3. Calculation Factors, ASCE/SEI 7-10, Ch. 13 Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-10 unless otherwise noted.

- a. Horizontal Seismic Design Force F_p: Calculated by Delegated-Design Contractor by ASCE/SEI 7-10, Equation 13.3-1. Factors below must be obtained for this calculation.
 - 1) S_{DS} = Spectral Acceleration: <**Insert value>**. Value applies to all components on Project.
 - 2) a_p = Component Amplification Factor: See Drawing Schedule for each component.
 - 3) I_p = Component Importance Factor: See Drawing Schedule for each component.
 - 4) W_p = Component Operating Weight: For each component. Obtain by Delegated-Design Contractor from equipment submittal.
 - 5) R_p = Component Response Modification Factor: See Drawing Schedule for each component.
 - 6) z = Height in Structure of Point of Attachment of Component for Base: Determined from Project Drawings for each component by Contractor. For items at or below the base, "z" shall be taken as zero.
 - 7) h = Average Roof Height of Structure for Base: Determine from Project Drawings by Delegated-Design Contractor.
- b. Vertical Seismic Design Force: Calculate by Delegated- Design Contractor using method explained in ASCE/SEI 7-10, Paragraph 13.3.1.
- c. Seismic Relative Displacement D_{pl}: Calculate by Delegated-Design Contractor using methods explained in ASCE/SEI 7-10, Paragraph 13.3.2. Factors below must be obtained for this calculation:
 - D_p = Relative Seismic Displacement that Each Component Must Be Designed to Accommodate: Calculate by Delegated-Design Contractor in accordance with ASCE/SEI 7-10, Paragraph 13.3.2.
 - 2) I_e = Structure Importance Factor: <**Insert value**>. Value applies to all components on Project.
 - 3) δ_{xA} = Deflection at Building Level x of Structure A: See Drawing Schedule for each component.
 - 4) δ_{yA} = Deflection at Building Level y of Structure A: See Drawing Schedule for each component.
 - 5) δ_{yB} = Deflection at Building Level y of Structure B: See Drawing Schedule for each component.
 - h_x = Height of Level x to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
 - 7) h_y = Height of Level y to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
 - 8) Δ_{aA} = Allowable Story Drift for Structure A: See Drawing Schedule for each component.
 - 9) Δ_{aB} = Allowable Story Drift for Structure B: See Drawing Schedule for each component.
 - 10) h_{sx} = Story Height Used in the Definition of the Allowable Drift Δ_a : See Drawing Schedule for each component.
- 4. Calculation Factors, ASCE/SEI 7-05, Ch. 13 Seismic Design Requirements for Nonstructural Components: All section, paragraph, equation, and table numbers refer to ASCE/SEI 7-05 unless otherwise noted.
 - a. Horizontal Seismic Design Force F_p: Calculated by Delegated-Design Contractor by ASCE/SEI 7-05, Equation 13.3-1. Factors below must be obtained for this calculation:
 - 1) S_{DS} = Spectral Acceleration: <**Insert value>**. Value applies to all components on Project.

- 2) a_p = Component Amplification Factor: See Drawing Schedule for each component.
- 3) I_p = Component Importance Factor: See Drawing Schedule for each component.
- 4) W_p = Component Operating Weight: Obtain by Delegated-Design Contractor for each component from component submittal.
- 5) R_p = Component Response Modification Factor: See Drawing Schedule for each component.
- 6) z = Height in Structure of Point of Attachment of Component for Base: Determine by Delegated-Design Contractor for each component from Project Drawings. For items at or below the base, "z" shall be taken as zero.
- 7) h = Average Roof Height of Structure for Base: Determine by Delegated-Design Contractor from Project Drawings.
- b. Vertical Seismic Design Force: Calculated by Delegated-Design Contractor using method explained in ASCE/SEI 7-05, Paragraph 13.3.1.
- c. Seismic Relative Displacement D_p: Calculated by Delegated-Design Contractor using methods explained in ASCE/SEI 7-05, Paragraph 13.3.2. Factors below must be obtained for this calculation:
 - 1) δ_{xA} = Deflection at Building Level x of Structure A: See Drawing Schedule for each component.
 - 2) δ_{yA} = Deflection at Building Level y of Structure A: See Drawing Schedule for each component.
 - 3) δ_{yB} = Deflection at Building Level y of Structure B: See Drawing Schedule for each component.
 - h_x = Height of Level x to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
 - 5) h_y = Height of Level y to which Upper Connection Point Is Attached: Determine for each component by Delegated-Design Contractor from Project Drawings and manufacturer's data.
 - 6) Δ_{aA} = Allowable Story Drift for Structure A: See Drawing Schedule for each component.
 - 7) Δ_{aB} = Allowable Story Drift for Structure B: See Drawing Schedule for each component.
 - 8) h_{sx} = Story Height Used in the Definition of the Allowable Drift Δ_a .: See Drawing Schedule for each component.
- C. Wind-Load Design Calculations:
 - Perform calculations to obtain force information necessary to properly select wind-load-restraint devices, fasteners, and anchorage. Perform calculations using methods acceptable to applicable code authorities and as presented in [ASCE/SEI 7-05] [ASCE/SEI 7-10] [ASCE/SEI 7-16] <Insert ASCE/SEI 7 edition or other wind-load calculation method required by authorities having jurisdiction>. Where "ASCE/SEI 7" is used throughout this Section, it is to be understood that the edition referred to in this subparagraph is intended as referenced throughout the Section Text unless otherwise noted.
 - a. Factors indicated below that are specific to individual pieces of equipment must be obtained by Contractor and must be included in individual component submittal packages.
 - b. Coordinate design wind-load calculations with seismic load calculations for equipment requiring both seismic and wind-load reinforcement. Comply with requirements in other Sections in addition to those in this Section for equipment mounted outdoors.

- 2. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch. 30. Perform calculations in accordance with one of the following, as appropriate:
 - a. PART 1: Low-Rise Buildings.
 - b. PART 2: Low-Rise Buildings (Simplified).
 - c. PART 3: Buildings with "h" less than 60 feet (18.3 m).
 - d. PART 4: Buildings with "h" greater than 60 feet (18.3 m) and less than 160 feet (48.8 m).
 - e. PART 5: Open Buildings.
- 3. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-16, Ch 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.
 - 1) Risk Category: [I] [II] [III] [IV] [V].
 - 2) h = Mean Roof Height: <**Insert value>**.
 - 3) V = Basic Wind Speed: <**Insert value>**.
 - 4) K_d = Wind Directionality Factor: **<Insert factor>**.
 - 5) Exposure Category: [**B**] [**C**] [**D**].
 - 6) K_{zt} = Topographic Factor: <**Insert factor>**.
 - 7) K_e = Ground Elevation Factor: <**Insert factor>**.
 - K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): <Insert coefficient>.
 - K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): <Insert coefficient>.
 - q_z = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - 11) q_h = Velocity Pressure: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-16 Section 26.10.1 or other source approved by authorities having jurisdiction.
 - 12) G = Gust-Effect Factor: [0.85] < Insert factor>.
 - 13) Enclosure Classification: < Insert classification>.
 - 14) GC_{pi} = Internal Pressure Coefficient: <**Insert coefficient>**.
- 4. Design wind pressure "p" for external sidewall-mounted equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30. Perform calculations in accordance with the following, as appropriate:
 - a. PART 1: Low-Rise Buildings.
 - b. PART 2: Low-Rise Buildings (Simplified).
 - c. PART 3: Buildings with "h" greater than 60 feet (18.3 m).
 - d. PART 4: Buildings with "h" less than 160 feet (48.8 m).
 - e. PART 5: Open Buildings.
- 5. Design wind pressure "p" for rooftop equipment is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-10, Ch. 30, PART 6: Building Appurtenances and Rooftop Structures and Equipment.
 - a. Risk Category: [I] [II] [III] [IV] [V].
 - b. h = Mean Roof Height: <**Insert value>**.
 - c. V = Basic Wind Speed: <Insert value>.
 - d. K_d = Wind Directionality Factor: <**Insert factor**>.
 - e. Exposure Category: [B] [C] [D].
 - f. K_{zt} = Topographic Factor: <**Insert factor**>.
 - g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): <**Insert** coefficient>.
 - h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): <**Insert** coefficient>.
- i. q_z = Velocity Pressure at Height z: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26 .10.1 or other source approved by authorities having jurisdiction.
- j. q_h = Velocity Pressure at Height h: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-10 Section 26 .10.1 or other source approved by authorities having jurisdiction.
- k. G = Gust-Effect Factor: [0.85] < Insert factor>.
- I. Enclosure Classification: <Insert classification>.
- m. GC_{pi} = Internal Pressure Coefficient: <Insert coefficient>.
- 6. Design wind force "F" for rooftop equipment and external sidewall-mounted equipment such as louvers is to be calculated by Delegated-Design Contractor using methods in ASCE/SEI 7-05, Ch. 6.
 - a. I = Importance Factor: <**Insert factor>**.
 - b. h = Mean Roof Height: <**Insert value**>.
 - c. V = Basic Wind Speed: <Insert value>.
 - d. K_d = Wind Directionality Factor: <**Insert factor**>.
 - e. Exposure Category: [B] [C] [D].
 - f. K_{zt} = Topographic Factor: <**Insert factor>**.
 - g. K_z = Velocity Pressure Exposure Coefficient (Evaluated at Height z): <Insert coefficient>.
 - h. K_h = Velocity Pressure Exposure Coefficient (Evaluated at Height h): <**Insert** coefficient>.
 - i. q_z = Velocity Pressure at Height z: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
 - j. q_h = Velocity Pressure at Roof Height h: Value calculated by delegated wind-load design Contractor using methods detailed in ASCE/SEI 7-05 Section 6.5.10 or other source approved by authorities having jurisdiction.
 - k. G = Gust-Effect Factor: [0.85] < Insert factor>.
 - *I.* GC_{pi}= Internal Pressure Coefficient: <**Insert coefficient>**.
 - m. GC_p = External Pressure Coefficient: <Insert coefficient>.
 - n. C_f = Force Coefficient: Value determined by delegated wind-load design Contractor from ASCE/SEI 7-05, Figures 6-21 through 6-23 or other source approved by authorities having jurisdiction.
 - o. A_f = Projected Area Normal to the Wind: Except where C_f is specified for the actual surface area, value determined by delegated wind-load design Contractor from equipment submittal or manufacturer.
- D. Consequential Damage: Provide additional seismic and wind-load restraints for suspended firesuppression system components or anchorage of floor-, roof-, or wall-mounted fire-suppression system components as indicated in [ASCE/SEI 7-05] [ASCE/SEI 7-10] [ASCE/SEI 7-16] so that failure of a non-essential or essential fire-suppression system component will not cause the failure of any other essential architectural, mechanical, or electrical building component.
- E. Fire/Smoke Resistance: Seismic-[and wind-load-]restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.
- F. Component Supports:
 - 1. Load ratings, features, and applications of all reinforcement components must be based on testing standards of a nationally recognized testing agency.
 - 2. All component support attachments must comply with force and displacement resistance requirements of [ASCE/SEI 7-05 Section 13.6] [ASCE/SEI 7-10 Section 13.6] [ASCE/SEI 7-16 Section 13.6].

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads: <Insert drawing designation>.

- 1. <a>

 Couble click here to find, evaluate, and insert list of manufacturers and products.
- 2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
- 3. Size: Factory or field cut to match requirements of supported equipment.
- 4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
- 5. Surface Pattern: Smooth, ribbed, or waffle pattern.
- 6. Infused nonwoven cotton or synthetic fibers.
- 7. Load-bearing metal plates adhered to pads.
- 8. Sandwich-Core Material: [Resilient] [and] [elastomeric] <Insert compound>.
 - a. Surface Pattern: Smooth, ribbed, or waffle pattern.
 - b. Infused nonwoven cotton or synthetic fibers.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts: < Insert drawing designation>.

- 1. <a>

 2. Couble click here to find, evaluate, and insert list of manufacturers and products.
- 2. Mounting Plates:
 - a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded[with threaded studs or bolts].
 - b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.
- 3. Elastomeric Material: Molded, oil- and water-resistant neoprene rubber, silicone rubber, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

- A. Restrained Elastomeric Isolation Mounts: < Insert drawing designation>.
 - 1. <a> <a>
 - 2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
 - a. Housing: Cast-ductile iron or welded steel.
 - b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 ELASTOMERIC HANGERS

- A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods: < Insert drawing designation>.
 - 1. <a>

 Couble click here to find, evaluate, and insert list of manufacturers and products.>
 - 2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 - 3. Damping Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel-to-steel contact.

2.6 SNUBBERS

- A. <a>

 A.
- B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
 - 1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be seismically prequalified in accordance with ACI 355.2 testing and designated in accordance with [ACI 318-08 Appendix D for 2009 IBC] [ACI 318-11 Appendix D for 2012 IBC] [ACI 318-14 Ch. 17 for 2015 or 2018 IBC].
 - 2. Preset Concrete Inserts: Seismically prequalified in accordance with ICC-ES AC446 testing.
 - 3. Anchors in Masonry: Design in accordance with TMS 402.
 - 4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
 - 5. Resilient Cushion: Maximum 1/4-inch (6-mm) air gap, and minimum 1/4 inch (6 mm) thick.

2.7 RESTRAINTS - RIGID TYPE

- A. <a>

 A.
- B. Description: Shop- or field-fabricated bracing assembly made of AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe as per NFPA 13, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.8 **RESTRAINTS - CABLE TYPE**

- A. <a>

 Ouble click here to find, evaluate, and insert list of manufacturers and products.>

- B. Seismic-Restraint Cables: [ASTM A1023/A12023M galvanized or ASTM A603 galvanizedsteel] [ASTM A492 stainless steel] cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic restraining cable service; with fittings attached by means of poured socket, swaged socket or mechanical (Flemish eye) loop.
- C. Restraint cable assembly with cable fittings must comply with ASCE/SEI 19. All cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.9 **RESTRAINT ACCESSORIES**

- A. <a>

 A.
- B. Hanger-Rod Stiffener: [Steel tube or steel slotted-support-system sleeve with internally bolted connections] [Reinforcing steel angle clamped] to hanger rod. Non-metallic stiffeners are unacceptable.
- C. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to [rigid restraints] [and] [restraint cables].

- D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
- E. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.10 POST-INSTALLED CONCRETE ANCHORS

- A. Mechanical Anchor Bolts:
 - 1. <a>

 - 2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.
- B. Adhesive Anchor Bolts:
 - 1. <a>

 < Double click here to find, evaluate, and insert list of manufacturers and products.>
 - Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.
- C. Provide post-installed concrete anchors that have been prequalified for use in seismic applications. Post-installed concrete anchors must comply with all requirements of [ASCE/SEI 7-05, Ch. 13] [ASCE/SEI 7-10, Ch. 13] [ASCE/SEI 7-16 Ch. 13].
 - 1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
 - 2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.
- D. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp (7.46 kW) that is not vibration isolated.
 - 1. Undercut expansion anchors are permitted.

2.11 CONCRETE INSERTS

- A. <a>

 A.
- B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC466 testing.
- C. Comply with ANSI/MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation[, wind control,] and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by [an evaluation service member of ICC-ES] [OSHPD] [an agency acceptable to authorities having jurisdiction].
- B. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry calculated static[, wind load,] and seismic loads within specified loading limits.

3.3 INSTALLATION OF VIBRATION CONTROL[, WIND-LOAD-RESTRAINT,] AND SEISMIC-RESTRAINT DEVICES

- A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Fire-Suppression Vibration Isolation, Seismic, and Wind-Load-Restraint Schedule, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.
- B. Provide seismic-restraint [and wind-load-restraint] devices for systems and equipment where indicated in Equipment Schedules or Vibration Isolation, Seismic, and Wind-Load-Restraint Schedules, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.
- C. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 3000 "Cast-in-Place Concrete."
- D. Installation of vibration isolators[, **wind-load restraints**,] and seismic restraints must not cause any stresses, misalignment, or change of position of equipment or piping.
- E. Comply with installation requirements of NFPA 13 for installation of all seismic-restraint devices.
- F. Comply with requirements in Section 07 7200 "Roof Accessories" for installation of equipment supports and roof penetrations.

- G. Equipment Restraints:
 - 1. Install snubbers on fire-suppression equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
 - 3. Install seismic-restraint devices using methods approved by [an evaluation service member of ICC-ES] [OSHPD] [an agency acceptable to authorities having jurisdiction] that provides required submittals for component.
- H. Piping Restraints:
 - 1. Comply with all requirements in NFPA 13.
 - 2. Design piping sway bracing in accordance with NFPA 13.
 - a. Maximum spacing of all sway bracing to be no greater than indicated in NFPA 13.
 - b. Design loading of all sway bracing not to exceed values indicated in NFPA 13.
- I. Install seismic-[and wind-load-]restraint devices using methods approved by [an evaluation service member of ICC-ES] [OSHPD] [an agency acceptable to authorities having jurisdiction] that provides required submittals for component.
- J. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- K. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- L. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- M. Post-Installed Concrete Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
 - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross structural seismic joints and other points where differential movement may occur, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the

connections as they approach equipment. Comply with requirements in Section 21 1200 "Fire-Suppression Standpipes," Section 21 1313 "Wet-Pipe Sprinkler Systems," and Section 21 1316 "Dry-Pipe Sprinkler Systems" for piping flexible connections.

3.5 ADJUSTING

- A. Adjust isolators after system is at operating weight.
- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Tests and Inspections:
 - 1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
 - 2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
 - 3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
 - 4. Test at no fewer than [**four**] <**Insert number**> of each type and size of installed anchors and fasteners selected by Architect.
 - 5. Test to 90 percent of rated proof load of device.
 - 6. Measure isolator restraint clearance.
 - 7. Measure isolator deflection.
 - 8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Units will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 21 0548

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor into the building.
- B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
 - 1. Product Data: For each type of product indicated. Include operating characteristics, piping type Class and all accessories.
 - 2. Piping System layout per NFPA 13, Chapter 14.
- C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
 - 2. Comply with standards of authorities having jurisdiction for fire-suppression waterservice piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. 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.
- D. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends and flange faces.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.6 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.
- B. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - 1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.
- C. Flanges: ASME B16.1, Class 125, cast iron.

2.2 PVC PIPE AND FITTINGS

- A. PVC Pipe: AWWA C900, Class 200 with bell end with gasket, and with spigot end.
- B. PVC Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.

2.3 SPECIAL PIPE FITTINGS

- A. Ductile-Iron Flexible Expansion Joints:
 - 1. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 2. Pressure Rating: 250 psig minimum.
- B. Ductile-Iron Deflection Fittings:
 - 1. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
 - 2. Pressure Rating: 250 psig minimum.

2.4 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Tubular-Sleeve Pipe Couplings:
 - 1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners, and with ends of same sizes as piping to be joined.
 - 2. Standard: AWWA C219.
 - 3. Center-Sleeve Material: Stainless steel.
 - 4. Gasket Material: Natural or synthetic rubber.
 - 5. Pressure Rating: 200 psig minimum.
 - 6. Metal Component Finish: Corrosion-resistant coating or material.

2.5 GATE VALVES

- A. UL-Listed or FM-Approved Gate Valves:
 - 1. 175-psig, UL-Listed, FM-Approved, Iron, Nonrising-Stem Gate Valves:
 - a. Description: Iron body and bonnet, bronze seating material, and inside screw.
 - b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
 - c. Pressure Rating: 175 psig minimum.
 - d. End Connections: Mechanical or push-on joint.
 - e. Indicator-Post Flange: Include on valves used with indicator posts.

2.6 GATE VALVE ACCESSORIES AND SPECIALTIES

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- A. Indicator Posts:
 - 1. Description: Vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.
 - 2. Standards: UL 789 and "Approval Guide," published by FM Global, listing.
 - 3. Manufacturers:
 - a. Kennedy Valve
 - b. Mueller Company
- B. Indicator-Post Supervisory Switches:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Potter Electric Signal Company.
 - b. System Sensor; a Honeywell company.
 - 2. Standard: UL 346.
 - 3. Type: Electrically supervised.
 - 4. Components: Single-pole, double-throw switch with normally closed contacts.
 - 5. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.7 CHECK VALVES

- A. UL-Listed, FM-Approved Check Valves:
 - 1. Description: Swing-check type with pressure rating, rubber-face checks unless otherwise indicated, and ends matching piping.
 - 2. Standards: UL 312 and "Approval Guide," published by FM Global, listing.
 - 3. Pressure Rating: 175 psig.

2.8 FIRE-DEPARTMENT CONNECTIONS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Elkhart Brass Mfg. Company, Inc.
 - 2. Fire-End & Croker Corporation.
 - 3. Guardian Fire Equipment, Inc.
 - 4. Potter Roemer.
- B. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire-department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch- high brass sleeve; and round escutcheon plate.
- C. Standard: UL 405.
- D. Connections: Two NPS 2-1/2 inlets and one NPS 6 outlet.

- E. Inlet Alignment: Horizontal.
- F. Finish Including Sleeve: Polished chrome plated.
- G. Escutcheon Plate Marking: "AUTO SPKR & STANDPIPE."
- H. Caps: Gasketed chrome plated brass with chain.

2.9 BACKFLOW PREVENTERS

- A. Double Check, Backflow Prevention Assemblies:
 - 1. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Ames Fire and Waterworks; a division of Watts Water Technologies, Inc.
 - b. FEBCO; SPX Valves and Controls
 - c. Watts Water Technologies, Inc.
 - d. Zurn Plumbing Products Group; Wilkins Water Control Products Division
- 2. Standard: ASSE 1015
- 3. Operation: Continuous pressure applications unless otherwise indicated.
- 4. Power Loss: 5 psig maximum, through middle one-third of flow range.
- 5. Size: 8 inches.
- 6. Design Flow Rate: 1000 gpm
- 7. Body Material: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
- 8. End Connections: For NPS 2-1/2 and larger.
- 9. Configuration: Designed for horizontal, straight through flow.
- 10. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

2.10 ALARM DEVICES

- A. General: UL 753 and "Approved Guide", published by FM Global, listing of types and sizes to mate and match piping and equipment.
- B. Supervisor Switches: Single pole, double throw; designed to signal valve in other than fully open position.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

- A. Water-Main Connection: Arrange with water utility company for tap of size and in location indicated in water main.
- B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

- C. Make connections larger than NPS 2 with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to MSS SP-60.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
 - 4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.
- D. Comply with NFPA 24 for fire-service-main piping materials and installation.
- E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
 - 1. Install encasement for piping according to ASTM A 674 or AWWA C105.
- F. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- G. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least 36 inches of cover over top.
 - 2. Under Railroad Tracks: With at least 48 inches of cover over top.
 - 3. In Loose Gravelly Soil and Rock: With at least 12 inches of additional cover.
- H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- I. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.
 - 1. Terminate fire-suppression water-service piping at building floor slab until buildingwater-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.
- J. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- K. Comply with requirements in Division 21 Sections for fire-suppression-water piping inside the building.
- L. Comply with requirements in Division 22 Section "Domestic Water Piping" for potablewater piping inside the building.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.
- B. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- C. Ream ends of tubes and remove burrs.
- D. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.
- E. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
- F. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.
- G. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.
- PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139.
- I. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.
- J. Do not use flanges or unions for underground piping.

3.4 ANCHORAGE INSTALLATION

- A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
 - 1. Concrete thrust blocks.
 - 2. Locking mechanical joints.
 - 3. Set-screw mechanical retainer glands.
 - 4. Bolted flanged joints.
 - 5. Heat-fused joints.
 - 6. Pipe clamps and tie rods.
- B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:
 - 1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
- C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

- A. UL-Listed or FM-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
- B. UL-Listed or FM-Approved Valves Other Than Gate Valves: Comply with NFPA 24.
- C. MSS Valves: Install as component of connected piping system.
- D. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Division 03 Section.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire-department connection to mains.

3.7 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size and capacity indicated. Include valves and test cocks. Install according to requirements of Plumbing and Health Department and Authorities having jurisdiction.
- B. Do not install bypass piping around backflow preventers.

3.8 ALARM DEVICE INSTALLATION

- A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.
- B. Supervisory Switches: Supervise valves in open position.
 - 1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate valve yoke.
 - 2. Indicator Posts: Drill and thread hole in upper barrel section at target plate on barrel of indicator post.
- C. Locking and Sealing: Secure unsupervised valves as follows:
 - 1. Valves: Install chain and padlock on open OS&Y gate valve.
 - 2. Post Indicators: Install padlock on wrench on indicator post.
- D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.
- E. Water-flow Indicators: Install in water service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane and bolt saddle to pipe.
- F. Connect alarm devices to building's fire alarm system. Wiring and fire alarm devices are specified in Division 28 Sections.

3.9 CONNECTIONS

A. Connect fire-suppression water-service piping to existing fire service main.

3.10 FIELD QUALITY CONTROL

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- A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.
- B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.
 - Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
- D. Prepare test and inspection reports.

3.11 IDENTIFICATION

- A. Install continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."
- B. Permanently attach equipment nameplate or marker indicating plastic fire-suppression water-service piping or fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel. Comply with requirements for identifying devices in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.12 CLEANING

- A. Clean fire-suppression water-service piping as follows:
 - 1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for three hours.

- c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
- d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports of purging activities.

3.13 PIPING SCHEDULE

- A. Underground fire-suppression water-service piping NPS 6 to NPS 12 shall be one of the following:
 - 1. Mechanical-joint, ductile-iron pipe; mechanical-joint, fittings; glands, gaskets, and bolts; and gasketed joints.
 - 2. PVC, Class 200 pipe listed for fire-protection service; PVC fittings of same class as pipe; and gasketed joints.

3.14 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
- B. Underground fire-suppression water-service shutoff valves NPS 3 and larger shall be one of the following:
 - 1. 250-psig, UL-listed or FM-approved, iron, nonrising-stem gate valves.
- C. Indicator-post underground fire-suppression water-service valves NPS 3 and larger shall be 250-psig, UL-listed or FM-approved, iron, nonrising-stem gate valves with indicator-post flange.
- D. Fire-suppression water-service check valves NPS 3 and larger shall be one of the following:
 - 1. UL-listed or FM-approved check valves.

END OF SECTION 21 1100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, fittings, and specialties.
 - 2. Fire-protection valves and cabinets.
 - 3. Fire-department connections.
 - 4. Alarm devices.

1.3 DEFINITIONS

A. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure 175 psig maximum.

1.4 SYSTEM DESCRIPTIONS

 A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.
- B. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.
 - 1. Minimum residual pressure at each hose-connection outlet is as follows:
 - a. NPS 2-1/2 Hose Connections: 100 psig.
 - 2. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:
 - a. NPS 2-1/2 Hose Connections: 175 psig.
- C. Perform Fire Hydrant Flow Test.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- 1. Shop Drawings: For fire-suppression standpipes. Include plans, elevations, sections, details, and Hydraulic Calculations.
- B. Coordination Drawings: Fire-suppression standpipes, drawn to scale, on which the following items are shown and coordinated with all other trades.
- C. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations.
- D. Welding certificates.
- E. Fire-hydrant flow test report.
- F. Hydraulic Calculations.
- G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- H. Field quality-control reports.
- I. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing firesuppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. 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.
- D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14, "Installation of Standpipe and Hose Systems."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Galvanized and Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M; with wall thickness not less than Schedule 40. Pipe ends may be factory or field formed to match joining method, for piping 2" and smaller.
- B. Galvanized and Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, with wall thickness not less than Schedule 10. Pipe ends may be factory or field formed to match joining method, for piping 2-1/2" and larger.
- C. Standard-Weight, Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, seamless steel pipe with threaded ends.
- D. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.
- E. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- F. Malleable or Ductile-Iron Unions: UL 860.
- G. Cast-Iron Flanges: ASME B16.1, Class 125.
- H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.
- J. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. National Fittings, Inc.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - 2. Pressure Rating: 300 psig minimum.
 - Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.
 - 1. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ringtype gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 - 1. Valves shall be UL listed or FM approved.
 - 2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
- B. Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Victaulic Company.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - 2. Standard: UL 1091 except with ball instead of disc.
 - 3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
 - 4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 5. Valves NPS 3: Ductile-iron body with grooved ends.
- C. Bronze Butterfly Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fivalco Inc.
 - b. Global Safety Products, Inc.
 - c. Milwaukee Valve Company.
 - 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig.
 - 4. Body Material: Bronze.
 - 5. End Connections: Threaded.
 - 6. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.

- g. Tyco Fire & Building Products LP.
- h. Victaulic Company.
- 7. Standard: UL 1091.
- 8. Pressure Rating: 175 psig.
- 9. Body Material: Cast or ductile iron.
- 10. Style: Lug or wafer.
- 11. End Connections: Grooved.
- D. Check Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Fire-End & Croker Corporation.
 - c. Fivalco Inc.
 - d. Globe Fire Sprinkler Corporation.
 - e. Kennedy Valve; a division of McWane, Inc.
 - f. Milwaukee Valve Company.
 - g. Mueller Co.; Water Products Division.
 - h. NIBCO INC.
 - i. Potter Roemer.
 - j. Reliable Automatic Sprinkler Co., Inc.
 - k. Tyco Fire & Building Products LP.
 - I. Victaulic Company.
 - m. Viking Corporation.
 - 2. Standard: UL 312.
 - 3. Pressure Rating: 250 psig minimum.
 - 4. Type: Swing check.
 - 5. Body Material: Cast iron.
 - 6. End Connections: Flanged or grooved.
- E. Bronze OS&Y Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. United Brass Works, Inc.
 - 2. Standard: UL 262.
 - 3. Pressure Rating: 175 psig.
 - 4. Body Material: Bronze.
 - 5. End Connections: Threaded.
- F. Iron OS&Y Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Clow Valve Company; a division of McWane, Inc.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.

- d. Mueller Co.; Water Products Division.
- e. NIBCO INC.
- f. Tyco Fire & Building Products LP.
- 2. Standard: UL 262.
- 3. Pressure Rating: 250 psig minimum
- 4. Body Material: Cast or ductile iron.
- 5. End Connections: Flanged or grooved.
- G. Indicating-Type Butterfly Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Fivalco Inc.
 - c. Global Safety Products, Inc.
 - d. Kennedy Valve; a division of McWane, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Tyco Fire & Building Products LP.
 - h. Victaulic Company.
 - 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig minimum.
 - 4. Valves NPS 2 and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
 - 5. Valves NPS 2-1/2 and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
 - 6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch visual indicating device.
- H. NRS Gate Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kennedy Valve; a division of McWane, Inc.
 - b. Mueller Co.; Water Products Division.
 - c. NIBCO INC.
 - d. Tyco Fire & Building Products LP.
 - 2. Standard: UL 262.
 - 3. Pressure Rating: 250 psig minimum.
 - 4. Body Material: Cast iron with indicator post flange.
 - 5. Stem: Nonrising.

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2.5 TRIM AND DRAIN VALVES

- A. General Requirements:
 - 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - 2. Pressure Rating: 175 psig minimum.
- B. Angle Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.
- C. Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Kennedy Valve; a division of McWane, Inc.
 - d. Milwaukee Valve Company.
 - e. NIBCO IN
 - f. Tyco Fire & Building Products LP.
 - g. Victaulic Company.

D. Globe Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

2.6 HOSE CONNECTIONS

- A. Nonadjustable Fire Valve Connections:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Elkhart Brass Mfg. Company, Inc.
 - b. Guardian Fire Equipment, Inc.
 - c. Potter Roemer.
 - d. Tyco Fire & Building Products LP.
 - 2. Standard: UL 668 hose valve for connecting fire hose.
 - 3. Pressure Rating: 300 psig minimum.
 - 4. Material: Brass or bronze.

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- 5. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
- 6. Inlet: Female pipe threads.
- 7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
- 8. Finish: Polished chrome plated.

2.7 FIRE VALVE CABINETS

- A. Fire Valve Cabinets:
 - 1. Provide fire valve cabinets as indicated on the fire protection drawings.
 - 2. Standard: UL listed cabinets for housing 2-1/2 inch fire valve.
 - 3. Mounting: Recessed.
 - 4. Size: box dimensions: 18 inch x 18 inch x 8 inch deep.
 - 5. See SECTION 10 4400 for additional specifications.

2.8 FIRE EXTINGUISHER AND FIRE VALVE CABINETS

- A. Fire Extinguisher and Fire Valve Cabinets (Combo):
 - 1. Provide fire extinguisher and fire valve cabinets as indicated on the fire protection drawings.
 - 2. Standard: UL listed cabinets for housing 2-1/2 inch fire valve.
 - 3. See SECTION 10 4400 for additional specifications.

2.9 ROOF MANIFOLD CONNECTION

- A. Free Standing Roof Manifold:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Guardian Fire Equipment, Inc.
 - b. Potter Roemer

2.10 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Electrically Operated Alarm Bell:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire-Lite Alarms, Inc.; a Honeywell company.
 - b. Notifier; a Honeywell company.
 - c. Potter Electric Signal Company.
 - 2. Standard: UL 464.
 - 3. Type: Vibrating, metal alarm bell.
 - 4. Size: 6-inch minimum diameter.
 - 5. Finish: Red-enamel factory finish, suitable for outdoor use.

- C. Water-Flow Indicators:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McDonnell & Miller; ITT Industries.
 - b. Potter Electric Signal Company.
 - c. System Sensor; a Honeywell company.
 - d. Viking Corporation.
 - 2. Standard: UL 346.
 - 3. Water-Flow Detector: Electrically supervised.
 - 4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 - 5. Type: Paddle operated.
 - 6. Pressure Rating: 250 psig.
 - 7. Design Installation: Horizontal or vertical.
- D. Valve Supervisory Switches:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire-Lite Alarms, Inc.; a Honeywell Company.
 - b. Potter Electric Signal Company.
 - c. System Sensor; a Honeywell company.
 - 2. Standard: UL 346.
 - 3. Type: Electrically supervised.
 - 4. Components: Single-pole, double-throw switch with normally closed contacts.
 - 5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AMETEK; U.S. Gauge Division.
 - 2. Ashcroft Inc.
 - 3. Brecco Corporation.
 - 4. WIKA Instrument Corporation.
- B. Standard: UL 393.
- C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- D. Pressure Gage Range: 0 to 250 psig minimum.
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

2.12 ESCUTCHEONS

- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
- B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with set-screws.
- C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chromeplated finish.

2.13 SLEEVES

- A. Cast-Iron Wall-Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.
- G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set-screws.

2.14 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex, Inc.
 - 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.15 GROUT

- A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydrauliccement grout.
- B. Characteristics: Nonshrink, and recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.16 HANGERS AND SUPPORTS

- A. Support piping with UL and FM approved hangers.
 - 1. All hangers, rods and supports shall be galvanized.
 - 2. Provide threaded rods and anchors.
 - 3. Powder driven inserts and fasteners shall not be allowed.
 - 4. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Anvil International
 - b. Tolco/NIBCO, Inc.
 - c. Globe Pipe Hangers, Inc.
 - d. Caddy/Erico Products, Inc.
 - e. Tyco Fire and Building Products LP

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 EXAMINATION

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression standpipe piping to water-service piping at service entrance into building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, pressure gage and other accessories at connection to firesuppression water-service piping.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 14 for installation of firesuppression standpipe piping.
- C. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install drain valves on standpipes. Extend drain piping to outside of building.
- E. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.
- F. Install alarm devices in piping systems.
- G. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.
- H. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- I. Fill wet-type standpipe system piping with water.

3.5 PAINTING OF PIPING

- A. All exposed black steel pipe shall be painted. All pipe surfaces shall be cleaned from grease and debris, primed and painted red unless otherwise noted on Contract Documents.
 - 1. Coordinate color with architectural finish schedule.

3.6 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

- D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- G. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- I. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.7 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.8 HOSE-CONNECTION INSTALLATION

- A. Install hose connections adjacent to standpipes.
- B. Install freestanding hose connections for access and minimum passage restriction.

- C. Install NPS 1-1/2 hose-connection valves with flow-restricting device.
- D. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device.
- E. Install wall-mounted-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose. Comply with requirements for cabinets in Division 10 Section "Fire Extinguisher Cabinets."

3.9 SLEEVE INSTALLATION

- A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
- B. Sleeves are not required for core-drilled holes.
- C. Permanent sleeves are not required for holes formed by removable PE sleeves.
- D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
- E. Install sleeves in new partitions, slabs, and walls as they are built.
- F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."
- G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."
- H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.
- I. Seal space outside of sleeves in concrete slabs and walls with grout.
- J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.
- K. Install sleeve materials according to the following applications:
 - 1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
 - 2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.
 - a. Extend sleeves 2 inches above finished floor level.
 - b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of castiron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements for flashing in Division 07 Section "Sheet Metal Flashing and Trim."

- 3. Sleeves for Piping Passing through Gypsum-Board Partitions:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.
 - c. Exception: Sleeves are not required for water-supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
- 4. Sleeves for Piping Passing through Concrete Roof Slabs: Galvanized-steel pipe.
- 5. Sleeves for Piping Passing through Exterior Concrete Walls:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
 - c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
- 6. Sleeves for Piping Passing through Interior Concrete Walls:
 - a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
 - b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.
- L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.10 SLEEVE SEAL INSTALLATION

- A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
- B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.12 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- 3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
- 4. Energize circuits to electrical equipment and devices.
- 5. Start and run air compressors.
- 6. Coordinate with fire-alarm tests. Operate as required.
- 7. Coordinate with fire-pump tests. Operate as required.
- 8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.13 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standardweight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

END OF DOCUMENT 21 1200

SECTION 21 1313 WET PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, fittings, and specialties.
 - 2. Fire-protection valves.
 - 3. Sprinklers.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.4 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
- B. Sprinkler system shall be approved by authorities having jurisdiction.
 - 1. Margin of Safety for Available Water Flow and Pressure: 10 P.S.I.
 - 2. Sprinkler Occupancy Hazard Classifications refer to drawings.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work, per NFPA 13, Chapter 14.
- C. Hydraulic Calculations.
- D. Sprinkler System design data is indicated on the fire protection drawings.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include fabricating, and installing sprinkler systems and providing working plans per NFPA 13. Base calculations on results of fire-hydrant flow test.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. 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.
- D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, Installation of Sprinkler Systems.

1.8 **PROJECT CONDITIONS**

- A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
 - 1. Notify Architect and Construction Manager no fewer than five days in advance of proposed interruption of sprinkler service.
 - 2. Do not proceed with interruption of sprinkler service without Architect's and Construction Manager's written permission.

1.9 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Standard Weight, Black-Steel Schedule 40 Pipe: ASTM A 53/A 53M or ASTM A 135, for piping 2" and smaller. Black steel Schedule 10 for piping 2-1/2" and larger.
- B. Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- C. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.
- D. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.
- E. Grooved-Joint, Steel-Pipe Appurtenances:

- 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. Tyco Fire & Building Products LP.
 - b. Victaulic Company.
 - c. Anvil Star Piping Inc.
- 2. Pressure Rating: 175 psig unless otherwise noted.
- Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
- 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.2 NON-FERROUS PIPING (MRI Area)

- A. Pressure pipe shall be Type L copper pipe conforming to ASTM B-88, annealed, seamless hard pipe. Listed for fire service.
- B. Fittings: Shall be wrought or cast brass conforming to ANSI B16.22 or ANSI B16.15. Listed for fire service.
- C. Flanges: Shall be wrought or cast brass conforming to B16.24 rated for 300 pounds. Gasket flange bolts shall be brass conforming to ASTM A307 with Hex nuts conforming to ANSI B18.2. Listed for fire service.
- D. Couplings: Rolled groove couplings conforming to UL listed FM approved.
- E. Dielectric Isolator: Provide dielectric couplings where dissimilar metals exist. Couplings shall be rated for 175 psi, UL listed or FM approved.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.
 - 1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
 - 2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ringtype gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
2.4 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 - 1. Valves shall be UL listed or FM approved.
 - 2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
- B. Ball Valves:
 - 1. Standard: UL 1091 except with ball instead of disc.
 - 2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
 - 3. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 4. Valves NPS 3: Ductile-iron body with grooved ends.
- C. Check Valves:
 - 1. Standard: UL 312.
 - 2. Pressure Rating: 300 psig.
 - 3. Type: Swing check.
 - 4. Body Material: Cast iron.
 - 5. End Connections: Flanged or grooved.
- D. Iron Butterfly Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Kennedy Valve; a division of McWane, Inc.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Tyco Fire & Building Products LP.
 - f. Victaulic Company.
 - 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig.
 - 4. Body Material: Cast or ductile iron.
 - 5. Style: Lug or wafer.
 - 6. End Connections: Grooved.

2.5 SPRINKLERS

- 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. Reliable Automatic Sprinkler Co., Inc.
 - 2. Tyco Fire & Building Products LP.
 - 3. Victaulic Company.
 - 4. Viking Corporation.

- B. General Requirements:
 - 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - 2. Pressure Rating for Residential Sprinklers: 175 psig maximum.
 - 3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
 - 4. Refer to drawings for sprinkler types and applicable locations.
- C. Sprinkler Finishes: See Drawings
- D. Special Coatings: See Drawings

2.6 GROUT

- A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydrauliccement grout.
- B. Characteristics: Nonshrink, and recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.7 HANGERS AND SUPPORTS

- A. Support piping with UL and FM approved hangers:
 - 1. All hangers, rods and supports shall be galvanized.
 - 2. Provide threaded rods and anchors.
 - 3. Powder driven inserts and fasteners shall not be allowed.
 - 4. Manufacturers: Subject to compliance with requirements, provide one of the following:
 - a. Anvil International
 - b. Tolco/NIBCO, Inc.
 - c. Globe Pipe Hangers, Inc.
 - d. Caddy/Erico Products, Inc.
 - e. Tyco Fire and Building Products LP

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.3 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- J. Install alarm devices in piping systems.
- K. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. **Powder driven inserts are not allowed.**
- L. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- M. Pressurize and check preaction sprinkler system piping and air-pressure maintenance devices.
- N. Fill sprinkler system piping with water.

3.4 PAINTING OF PIPING

A. All exposed black steel pipe shall be painted. All pipe surfaces shall be cleaned from grease and debris, primed and painted red unless otherwise noted on Contract Documents.

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.6 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.7 SPRINKLER INSTALLATION

- A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels. Sprinklers may be centered in tile either by hard pipe or with flexible connectors. Connectors shall be UL 2443 listed, Flex Heads Industries or equal.
- B. Sprinkler Head Location: Sprinkler heads shall be installed no closer than 4 inches to any Ceiling grid or wall.
- C. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.8 ESCUTCHEON INSTALLATION

- A. Install escutcheons for penetrations of walls, ceilings, and floors.
- B. Escutcheons for Piping:
 - 1. Piping with Fitting or Sleeve Protruding from Wall: deep pattern.
 - 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: cast brass with polished chrome-plated finish.
 - 3. Bare Piping at Ceiling Penetrations in Finished Spaces cast brass with polished chrome-plated finish.

3.9 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run excess-pressure pumps.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF DOCUMENT 21 1313

SECTION 21 1316 DRY PIPE AND PRE-ACTION SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipes, fittings, and specialties.
 - 2. Fire-protection valves.
 - 3. Sprinkler specialty pipe fittings.
 - 4. Sprinklers.
 - 5. Alarm devices.
 - 6. Control panels.
 - 7. Pressure gages.

1.3 DEFINITIONS

A. Standard-Pressure Sprinkler Piping: Dry-pipe sprinkler system piping designed to operate at working pressure 175 psig maximum.

1.4 SYSTEM DESCRIPTIONS

- A. Dry-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Opening of sprinklers releases compressed air and permits water pressure to open dry-pipe valve. Water then flows into piping and discharges from sprinklers that are open.
- B. Combined Dry-Pipe and Preaction Sprinkler System: Automatic sprinklers are attached to piping containing compressed air. Fire-detection system in same area as sprinklers actuates tripping devices that open dry-pipe valve without loss of air pressure and actuates fire alarm. Water discharges from sprinklers that have opened.
- C. Double-Interlock Preaction Sprinkler System: Automatic sprinklers are attached to piping containing low-pressure air. Actuation of a fire-detection system in the same area as sprinklers opens the deluge valve permitting water to flow into the sprinkler piping; a closed solenoid valve in the sprinkler piping is opened by another fire-detection device; then water will discharge from sprinklers that have opened.

1.5 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

- B. Shop Drawings: For dry-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work, per NFPA 13, Chapter 14.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Hydraulic Calculations.
- D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Domestic water piping.
 - 2. Compressed air piping.
 - 3. HVAC hydronic piping.
 - 4. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- E. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- 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. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:
 - 1. NFPA 13, Installation of Sprinkler Systems.
 - 2. NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances.

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 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. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of

sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

- A. Galvanized steel pipe shall be Schedule 40 for pipe sizes 2" and smaller. Galvanized steel pipe shall be Schedule 10 for pipe sizes 2-1/2" and larger.
- B. Standard Weight, Galvanized-Steel Pipe: ASTM A 53/A 53M. Pipe ends may be factory or field formed to match joining method.
- C. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.
- D. Galvanized, Steel Couplings: ASTM A 865, threaded.
- E. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - 2. Pressure Rating: 175 psig minimum.
 - 3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
 - 4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.
 - 1. Class 125, Cast-Iron and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
 - 2. Class 250, Cast-Iron and Class 300, Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.4 LISTED FIRE-PROTECTION VALVES

- A. General Requirements:
 - 1. Valves shall be UL listed or FM approved.
 - 2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
- B. Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Victaulic Company.
 - 2. Standard: UL 1091 except with ball instead of disc.
 - 3. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
 - 4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
 - 5. Valves NPS 3: Ductile-iron body with grooved ends.
- C. Indicating-Type Butterfly Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Milwaukee Valve Company.
 - c. Tyco Fire & Building Products LP.
 - d. Victaulic Company.
 - 2. Standard: UL 1091.
 - 3. Pressure Rating: 175 psig minimum.
 - 4. Valves NPS 2 and Smaller:
 - a. Valve Type: Ball or butterfly.
 - b. Body Material: Bronze.
 - c. End Connections: Threaded.
 - 5. Valves NPS 2-1/2 and Larger:
 - a. Valve Type: Butterfly.
 - b. Body Material: Cast or ductile iron.
 - c. End Connections: Flanged, grooved, or wafer.
 - 6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch visual indicating device.

2.5 TRIM AND DRAIN VALVES

- A. General Requirements:
 - 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - 2. Pressure Rating: 175 psig minimum.

- B. Ball Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. NIBCO INC.
- C. Globe Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fire Protection Products, Inc.
 - b. United Brass Works, Inc.

2.6 SPECIALTY VALVES

- A. General Requirements:
 - 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - 2. Pressure Rating: Standard-Pressure Piping Specialty Valves: 175 psig minimum.
 - 3. Body Material: Cast or ductile iron.
 - 4. Size: Same as connected piping.
 - 5. End Connections: Flanged or grooved.
- B. Dry-Pipe Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Reliable Automatic Sprinkler Co., Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Viking Corporation.
 - 2. Standard: UL 260
 - 3. Design: Differential-pressure type.
 - 4. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - 5. Air Compressor:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Gast Manufacturing Inc.
 - 2) General Air Products, Inc,
 - 3) Viking Corporation.

- b. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
- c. Motor Horsepower: Fractional.
- d. Power: 120-V ac, 60 Hz, single phase.
- C. Automatic (Ball Drip) Drain Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFAC Inc.
 - b. Reliable Automatic Sprinkler Co., Inc.
 - c. Tyco Fire & Building Products LP.
 - 2. Standard: UL 1726.
 - 3. Pressure Rating: 175 psig minimum.
 - 4. Type: Automatic draining, ball check.
 - 5. Size: NPS 3/4.
 - 6. End Connections: Threaded.

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

- A. General Requirements for Dry-Pipe-System Fittings: UL listed for dry-pipe service.
- B. Branch Outlet Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Victaulic Company.
 - 2. Standard: UL 213.
 - 3. Pressure Rating: 175 psig minimum.
 - 4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
 - 5. Type: Mechanical-T and -cross fittings.
 - 6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
 - 7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
 - 8. Branch Outlets: Grooved, plain-end pipe, or threaded.
- C. Sprinkler Inspector's Test Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGF Manufacturing Inc.
 - b. Tyco Fire & Building Products LP.
 - c. Viking Corporation.
 - 2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - 3. Pressure Rating: 175 psig minimum.

- 4. Body Material: Cast- or ductile-iron housing with sight glass.
- 5. Size: Same as connected piping.
- 6. Inlet and Outlet: Threaded.
- D. Flexible, Sprinkler Hose Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: FlexHead Industries, Inc.
 - 2. Standard: UL 1474.
 - 3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
 - 4. Pressure Rating: 175 psig minimum.
 - 5. Size: Same as connected piping, for sprinkler.

2.8 SPRINKLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Reliable Automatic Sprinkler Co., Inc.
 - 2. Tyco Fire & Building Products LP.
 - 3. Victaulic Company.
 - 4. Viking Corporation.
- B. General Requirements:
 - 1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
 - 2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
- C. Automatic Sprinklers with Heat-Responsive Element:
 - 1. Nonresidential Applications: UL 199.
 - 2. Characteristics: Nominal 1/2-inch orifice with discharge coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
- D. Sprinkler Finishes: See Drawings
- E. Special Coatings: See Drawings
- F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

2.9 ALARM DEVICES

- A. Alarm-device types shall match piping and equipment connections.
- B. Pressure Switches:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Potter Electric Signal Company.
- b. Tyco Fire & Building Products LP.
- c. Viking Corporation.
- 2. Standard: UL 346.
- 3. Type: Electrically supervised water-flow switch with retard feature.
- 4. Components: Single-pole, double-throw switch with normally closed contacts.
- 5. Design Operation: Rising pressure signals water flow.
- C. Valve Supervisory Switches:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Potter Electric Signal Company.
 - 2. Standard: UL 346.
 - 3. Type: Electrically supervised.
 - 4. Components: Single-pole, double-throw switch with normally closed contacts.
 - 5. Design: Signals that controlled valve is in other than fully open position.

2.10 CONTROL PANELS

- A. Description: Single-area, two-area, or single-area cross-zoned type control panel as indicated, including NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves. Panels contain power supply; battery charger; standby batteries; field-wiring terminal strip; electrically supervised solenoid valves and polarized fire-alarm bell; lamp test facility; single-pole, double-throw auxiliary alarm contacts; and rectifier.
 - 1. Panels: UL listed and FM Global approved when used with thermal detectors and Class A detector circuit wiring. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.
 - 2. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.
 - 3. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.11 PRESSURE GAGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AMETEK, Inc.; U.S. Gauge Division.
 - 2. Ashcroft, Inc.
 - 3. Brecco Corporation.
 - 4. WIKA Instrument Corporation.
- B. Standard: UL 393.

- C. Dial Size: 3-1/2- to 4-1/2-inch diameter.
- D. Pressure Gage Range: 0 to 250 psig minimum.
- E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.
- F. Air System Piping Gage: Include "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 13 for installation of sprinkler piping.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Connect compressed-air supply to dry-pipe sprinkler piping.
- J. Connect air compressor to the following piping and wiring:
 - 1. Pressure gages and controls.
 - 2. Electrical power system.
 - 3. Fire-alarm devices, including low-pressure alarm.
- K. Install alarm devices in piping systems.

- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in NFPA 13 for hanger materials.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- N. Drain dry-pipe sprinkler piping.
- O. Pressurize and check dry-pipe sprinkler system piping and air compressors.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

- I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- J. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.
- K. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- L. Copper-Tubing, Pressure-Sealed Joints: Join copper tube and copper pressure-seal fittings with tools recommended by fitting manufacturer.
- M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
 - 1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
 - 2. Dry-Pipe and Deluge Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
 - a. Install air compressor and compressed-air supply piping.
 - b. Air-Pressure Maintenance Device: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer; pressure ratings with 14-to 60-psig adjustable range; and 175-psig maximum inlet pressure.
 - c. Install compressed-air supply piping from building's compressed-air piping system.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

- B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
- C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.6 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems".

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
 - 4. Energize circuits to electrical equipment and devices.
 - 5. Start and run air compressors.
 - 6. Coordinate with fire-alarm tests. Operate as required.
 - 7. Coordinate with fire-pump tests. Operate as required.
 - 8. Verify that equipment hose threads are same as local fire-department equipment.
- C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.9 PIPING SCHEDULE

- A. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.
- B. Copper-tube, extruded-tee connections may be used for tee branches in copper tubing instead of specified copper fittings. Branch-connection joints must be brazed.
- C. Standard-pressure, dry-pipe sprinkler system, NPS 2 and smaller shall be one of the following:
 - 1. Standard-weight, Schedule 40, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

- 2. Standard-weight, Schedule 40, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
- D. Standard-pressure, dry-pipe sprinkler system, NPS 2-1/2 to NPS 4, shall be one of the following:
 - 1. Standard-weight, Schedule 10, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
 - 2. Standard-weight, Schedule 10, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 21 1316

SECTION 21 2200 CLEAN AGENT FIRE EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Piping and piping specialties.
 - 2. Extinguishing-agent containers.
 - 3. Extinguishing agent.
 - 4. Detection and alarm devices.
 - 5. Control and alarm panels.
 - 6. Accessories.
 - 7. Connection devices for and wiring between system components.
 - 8. Connection devices for power and integration into building's fire-alarm system.

1.3 DEFINITIONS

- A. ATS: Acceptance Testing Specifications.
- B. EPO: Emergency Power Off.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Data for Credit EA 4: Documentation indicating that clean agents comply.
- C. Shop Drawings: For clean-agent fire-extinguishing system signed and sealed by a qualified professional engineer.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Include design calculations.
 - 3. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 4. Wiring Diagrams: For power, signal, and control wiring.
- D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Domestic water piping.

- 2. Items Penetrating Finished Ceiling Include the Following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
- E. Permit Approved Drawings: Working plans, prepared according to NFPA 2001, that have been approved by authorities having jurisdiction. Include design calculations.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For clean agent system to include Operation and Maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. FM Global Compliance: Provide components that are FM Approved and that are listed in FM Global's "Approval Guide."
- C. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

1.6 INSTALLING CONTRACTOR

- A. The installing contractor shall hold a State of Florida Class I or III Fire Protection license.
- B. The installing contractor shall hold a State of Florida Alarm System Contractor I (EF) license.
- C. The installing contractor shall hold a NICET Level III Certification in Special Hazard Engineering Technology.
- D. The same individual (Qualifier) shall hold the Fire Protection license, Electrical license, and NICET Level III Certification.
- E. The installation shall be supervised by an employee of the installing contractor who is NICET Level II Certified in Special Hazard Engineering Technology.
- F. The installing contractor must be regularly engaged in the design, installation, servicing and maintenance of Clean Agent Fire Suppression Systems. Said contractor shall show proof (upon request) of completion for projects of a similar size and nature.
- G. The installing contractor shall be an authorized, stocking and factory trained distributor of Ansul Sapphire (Novec 1230) systems. A single contractor shall complete the entire system installation. Subcontracting either the mechanical or electrical portion of the installation shall NOT be accepted.

1.7 CLEAN-AGENT SYSTEMS

- A. Manufacturers: Clean Agent shall be a Sapphire (Novec 1230) system. Subject to compliance with requirements, provide products by one of the following:
 - 1. Ansul Incorporated.
 - 2. Chemetron Fire Systems; a UTC Fire & Security company.

- B. Description: Sapphire clean-agent fire-extinguishing system shall be an engineered system for total flooding of the hazard area including the room cavity below the ceiling and below the raised floor (if applicable). If smoke is detected below the raised floor, or if smoke is detected below the ceiling, extinguishing agent shall be discharged in areas below the ceiling and below the floor.
- C. Delegated Design: Design clean-agent fire-extinguishing system and obtain approval from authorities having jurisdiction. Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor. Use clean agent indicated and in concentration suitable for normally occupied areas.
- D. Performance Requirements: Discharge Sapphire agent completely within 10 seconds of valve actuation and maintain 4.2 percent concentration by volume at 70 deg F for 10-minute holding time in hazard areas.
 - 1. Sapphire agent concentration in hazard areas greater than 10.0 percent immediately after discharge or less than 4.0 percent throughout holding time will not be accepted without written authorization from Owner and authorities having jurisdiction.
 - 2. System Capabilities: Minimum 72-psig calculated working pressure and 360-psig initial charging pressure.
- E. Verified Detection: Devices located in single zone. Sound alarm on activating any singledetection device, and discharge extinguishing agent (after time delay) on actuating any seconddetection device.
- F. System Operating Sequence:
 - 1. Actuating First Detector: Visual indication on annunciator panel. Energize audible and visual alarms (slow pulse), shut down air-conditioning and ventilating systems serving protected area, close doors in protected area, and send signal to building fire-alarm system.
 - 2. Actuating Second Detector: Visual indication on annunciator panel. Energize audible and visual alarms (fast pulse), shut down power to protected equipment, start time delay for extinguishing-agent discharge for 30 seconds, and then discharge extinguishing agent. On agent discharge, release preaction valve to allow water to fill sprinkler system.
 - 3. Extinguishing-agent discharge will operate audible alarms and strobe lights inside and outside the protected area.
- G. Manual stations shall immediately discharge Sapphire extinguishing agent when activated.
- H. Operating abort switches will delay extinguishing-agent discharge while being activated. Release of hand pressure on the switch will cause agent discharge if the time delay has expired.
- I. EPO: Will terminate power to protected equipment immediately on actuation.
- J. Low-Agent Pressure Switch: Initiate trouble alarm if sensing less than set pressure.
- K. Power Transfer Switch: Transfer from normal to stand-by power source.

1.8 **PIPING MATERIALS**

A. Piping, Valves, and Discharge Nozzles: Comply with types and standards listed in NFPA 2001, Section "Distribution," for charging pressure of system.

1.9 PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40. All piping and fittings shall be rated to withstand operating pressures as estimated by the hydraulic calculation software.
 - 1. Threaded Fittings:
 - a. Malleable-Iron Fittings: ASME B16.3, Class 300.
 - b. Flanges and Flanged Fittings: ASME B16.5, Class 300 unless Class 600 is indicated.
 - c. Fittings Working Pressure: 620 psig minimum.
 - d. Flanged Joints: Class 300 minimum.
 - 2. Steel, Grooved-End Fittings: FM Approved and NRTL listed, ASTM A 47/A 47M malleable iron or ASTM A 536 ductile iron, with dimensions matching steel pipe and ends factory grooved according to AWWA C606.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel.
- D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- E. Steel, Keyed Couplings: UL 213, AWWA C606, approved or listed for clean-agent service, and matching steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gasket, and steel bolts and nuts.

1.10 VALVES

- A. General Valve Requirements:
 - 1. UL listed or FM Approved for use in fire-protection systems.
 - 2. Compatible with type of clean agent used.
- B. Container Valves: With electric solenoid and manual-release lever, capable of immediate and total agent discharge and suitable for intended flow capacity.
- C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure relief device.
- D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

1.11 EXTINGUISHING-AGENT CONTAINERS

- A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.
 - 1. Finish: Red enamel or epoxy paint.
 - 2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
 - 3. Manifold: Fabricate with valves, pressure switches, selector switch, and connections for main- and reserve-supply banks of multiple storage containers.
 - 4. Storage-Tank Brackets: Factory fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

1.12 FIRE-EXTINGUISHING CLEAN AGENT

- A. F-K-5-1-12 Sapphire Clean Agent: Flouroketone.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: **3M**

1.13 DISCHARGE NOZZLES

A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, size, discharge pattern, and capacity required for application.

1.14 CONTROL PANELS

- A. Description: FM Approved or NRTL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system. Panel shall be listed for release functions.
- B. Power Requirements: 120-V ac; with electrical contacts for connection to system components and fire-alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.
- C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.
 - 1. Mounting: Recessed flush with surface.
- D. Supervised Circuits: Separate circuits for each independent hazard area.
 - 1. Detection circuits equal to the required number of zones, or addressable devices assigned to the required number of zones.
 - 2. Manual pull-station circuit.
 - 3. Alarm circuit.
 - 4. Release circuit.
 - 5. Abort circuit.
 - 6. EPO circuit.

- E. Control-Panel Features:
 - 1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
 - 2. Automatic switchover to standby power at loss of primary power.
 - 3. Storage container, low-pressure indicator.
 - 4. Service disconnect to interrupt system operation for maintenance with visual status indication on the annunciator panel.
 - 5. 250 Event Memroy Log
- F. Graphic Annunciator Panel: Graphic type showing protected, hazard-area plans, as well as locations of detectors and manual stations. Include lamps to indicate device-initiating alarm, electrical contacts for connection to control panel, and stainless-steel or aluminum enclosure.
- G. Standby Power: Sealed lead calcium batteries with capacity to operate system for 24 hours and alarm for minimum of 15 minutes. Include automatic battery charger that has a varying charging rate between trickle and high depending on battery voltage, and that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, automatic transfer switch, and suitable enclosure.

1.15 DETECTION DEVICES

- A. General Requirements for Detection Devices:
 - 1. Comply with NFPA 2001, NFPA 72, and UL 268.
 - 2. 24-V dc, nominal.
- B. Photoelectric Smoke Detectors: LED light source and silicon photodiode receiving element.
- C. Signals to the Building Fire Alarm Control Panel: Any type of local system trouble is reported to the building fire alarm control panel as a composite "trouble" signal. Alarms on each system zone are individually reported to the building fire alarm control panel as separately identified zones.

1.16 MANUAL STATIONS

- A. General Description: FM Approved or NRTL listed, with clear plastic hinged cover, low voltage compatible with controls. Include contacts for connection to control panel.
- B. Manual Release: "MANUAL RELEASE" caption, and red finish. Unit can manually discharge extinguishing agent with operating device that remains engaged until unlocked.
- C. Abort Switch: "ABORT" caption, momentary contact, with green finish.

1.17 SWITCHES

- A. Description: FM Approved or NRTL listed, where available, low voltage compatible with controls. Include contacts for connection to control panel.
 - 1. Low-Agent Pressure Switches: Pneumatic operation.
 - 2. Power Transfer Switches: Key-operation selector, for transfer of release circuit signal from main supply to reserve supply.

3. Door Closers: Magnetic retaining and release device or electrical interlock to cause the door operator to drive the door closed.

1.18 ALARM DEVICES

- A. Description: Listed and labeled by an NRTL or FM Approved, low voltage, and surface mounting. Comply with requirements in Division 28 Section "Digital, Addressable Fire-Alarm System" or Division 28 Section "Zoned (DC Loop) Fire-Alarm System" for alarm and monitoring devices.
- B. Bells: Minimum 6-inch diameter.
- C. Horns: 90 to 94 dBA.
- D. Strobe Lights: Translucent lens, with "FIRE", "AGENT" or similar caption.

1.19 ELECTRICAL POWER AND WIRING

A. Electrical power, wiring, and devices are specified in Division 26.

PART 2 - EXECUTION

2.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with hazard-area leakage requirements, installation tolerances, and other conditions affecting work performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 SAPPHIRE AGENT PIPING APPLICATIONS

- A. Flanged pipe and fittings and flanged joints may be used to connect to specialties and accessories and where required for maintenance.
- B. NPS 2 and Smaller: Schedule 40, steel pipe; malleable-iron threaded fittings; and threaded joints.
- C. NPS 2-1/2 and Larger: Schedule 40, steel pipe; forged-steel welding fittings; and welded joints.

2.3 CLEAN-AGENT PIPING INSTALLATION

- A. Install clean-agent extinguishing piping and other components level and plumb, according to manufacturers' written instructions.
- B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.
- C. Install extinguishing-agent containers anchored to substrate.
- D. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section "Distribution."
 - 1. Install valves designed to prevent entrapment of liquid, or install pressure relief devices in valved sections of piping systems.

- 2. Support piping using supports and methods according to NFPA 2001 and manufacturer's Installation Manual. All piping shall be properly thrust blocked to prevent any movement during agent discharge. Extra bracing shall be provided at discharge nozzles.
- 3. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section "Detection, Actuation, and Control Systems," as required for supervised system application.

2.4 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to equipment, allow space for service and maintenance.
- C. Connect electrical devices to control panel and to building's fire-alarm system. Electrical power, wiring, and devices are specified in Division 28 Section "Digital, Addressable Fire-Alarm System" or Division 28 Section "Zoned (DC Loop) Fire-Alarm System."

2.5 IDENTIFICATION

- A. Identify system components and equipment. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Identify piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001.
- C. Install signs at entry doors for protected areas to warn occupants that they are entering a room protected with a clean-agent fire-extinguishing system.
- D. Install signs at entry doors to advise persons outside the room the meaning of the horn(s), bell(s), and strobe light(s) outside the protected space.

2.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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.
- D. Tests and Inspections:
 - 1. After installing clean-agent extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections "Inspection and Test Procedures" and "System Function Tests." Certify compliance with test parameters.

- 3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
- 4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
- 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Units will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

2.7 CLEANING

A. Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, using a suitable nonflammable cleaner. Pipe network shall be free of particulate matter and oil residue before installing nozzles or discharge devices.

2.8 SYSTEM FILLING

- A. Preparation:
 - 1. Verify that piping system installation is completed and cleaned.
 - 2. Check for complete enclosure integrity.
 - 3. Check operation of ventilation and exhaust systems.
- B. Filling Procedures:
 - 1. Agent containers shall be factory filled.

2.9 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain clean-agent fireextinguishing systems.

END OF SECTION 21 2200

SECTION 21 3113 ELECTRIC DRIVE CENTRIFUGAL FIRE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. In-line fire pumps.

1.3 PERFORMANCE REQUIREMENTS

A. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For fire pumps, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 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.
- B. Product Certificates: For each fire pump, from manufacturer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire pumps to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 20, "Installation of Stationary Pumps for Fire Protection."

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

- A. Description: Factory-assembled and -tested fire-pump and driver unit.
- B. Base: Fabricated and attached to fire-pump and driver unit with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.

2.2 IN-LINE FIRE PUMPS

- A. Manufacturers: Subject to compliance with requirements:
 - 1. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.
 - 2. Peerless Pump, Inc.
 - 3. Pentair Pump Group; Aurora Pump.
 - 4. Pentair Pump Group; Fairbanks Morse.

B. Pump:

- 1. Standard: UL 448 for in-line pumps for fire service.
- 2. Casing: Radially split case, cast iron with ASME B16.1 pipe-flange connections.
- 3. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
- 4. Wear Rings: Replaceable bronze.
- 5. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
- 6. Mounting: Pump and driver shaft is vertical, with motor above pump and pump on base.
- C. Coupling: None or rigid.

D. Driver:

- 1. Standard: UL 1004A.
- 2. Type: Electric motor; NEMA MG 1, polyphase Design B.

2.3 GROUT

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydrauliccement grout.
- B. Characteristics: Nonshrink and recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.4 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect fire pumps according to UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."
 - 1. Verification of Performance: Rate fire pumps according to UL 448.
- B. Fire pumps will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Fire-Pump Installation Standard: Comply with NFPA 20 for installation of fire pumps, relief valves, and related components.
- B. Equipment Mounting: Install fire pumps on concrete bases. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete".
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

- 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NFPA 20.
- D. Support piping and pumps separately so weight of piping does not rest on pumps.
- E. Install valves that are same size as connecting piping. Comply with requirements for fireprotection valves specified in Division 21 Section "Fire-Suppression Standpipes".
- F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in Division 21 Section "Fire-Suppression Standpipes".
- G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NFPA 20.
- H. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.
- I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.3 ALIGNMENT

- A. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- B. Align piping connections.
- C. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.4 CONNECTIONS

- A. Comply with requirements for piping and valves specified in Division 21 Section "Fire-Suppression Standpipes". Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect fire pumps to their controllers.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NFPA 20.

3.6 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps.

END OF DOCUMENT 21 3113

SECTION 21 3400 PRESSURE MAINTENANCE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Multistage, pressure-maintenance pumps.

1.3 PERFORMANCE REQUIREMENTS

A. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For pumps, accessories, and specialties. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 MULTISTAGE, PRESSURE-MAINTENANCE PUMPS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. A-C Fire Pump Systems; a business of ITT Industries.
 - 2. Grundfos Management A/S; Grundfos Pumps Corporation U.S.A.

- 3. PACO Pumps; Grundfos Pumps Corporation U.S.A.
- 4. TACO Incorporated.
- B. Description: Factory-assembled and -tested, multistage, barrel-type vertical pump as defined in HI 2.1-2.2 and HI 2.3; designed for surface installation with pump and motor direct coupled and mounted vertically.
- C. Pump Construction:
 - 1. Barrel: Stainless steel.
 - 2. Suction and Discharge Chamber: Cast iron with flanged inlet and outlet.
 - 3. Pump Head/Motor Mount: Cast iron.
 - 4. Impellers: Stainless steel, balanced, and keyed to shaft.
 - 5. Pump Shaft: Stainless steel.
 - 6. Seal: Mechanical type with carbon rotating face and silicon-carbide stationary seat.
 - 7. Intermediate Chamber Bearings: Aluminum-oxide ceramic or bronze.
 - 8. Chamber-Base Bearing: Tungsten carbide.
 - 9. O-Rings: EPDM or NBR.
- D. Motor: Single speed with permanently lubricated ball bearings and rigidly mounted to pump head. Comply with requirements in Division 21 Section "Common Motor Requirements for Fire Suppression Equipment."
 - 1. Power Cord: Factory-connected to motor for field connection to controller and at least 10 feet long.
- E. Nameplate: Permanently attached to pump and indicating capacity and characteristics.
- F. Capacities and Characteristics:
 - 1. Working Pressure: 175-psig minimum.
 - 2. Discharge and Suction Flanges: Class 250.
 - 3. Electrical Characteristics:
 - a. Volts: 240.
 - b. Phases: Three.
 - c. Hertz: 60.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 21 Section "Common Motor Requirements for Fire Suppression Equipment."
 - 1. Motor Sizes: Minimum size as indicated; if not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Electrical Devices and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. NFPA Standard: Comply with NFPA 20 for installation of pressure-maintenance pumps.
- B. Base-Mounted Pump Mounting: Install pumps on concrete bases. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Attach pumps to equipment base using anchor bolts.
- C. Install pressure-maintenance pumps according to HI 1.4.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Pressure-maintenance pumps will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.3 ADJUSTING

- A. Lubricate pumps as recommended by manufacturer.
- B. Set field-adjustable pressure-switch ranges as indicated.

END OF DOCUMENT 21 3400
SECTION 21 3900 CONTROLLERS FOR FIRE PUMP DRIVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Full-service, reduced-voltage controllers rated 600 V and less.
 - 2. Limited-service controllers rated 600 V and less.
 - 3. Controllers for diesel-drive fire pumps.
 - 4. Remote alarm panels.
 - 5. Low-suction-shutdown panels.

1.3 **DEFINITIONS**

- A. ATS: Automatic transfer switch(es).
- B. ECM: Electronic control module.
- C. MCCB: Molded-case circuit breaker.
- D. N.O.: Normally open.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 1. Show tabulations of the following:
 - a. Each installed unit's type and details.
 - b. Enclosure types and details for types other than NEMA 250, Type 2.
 - c. Factory-installed devices.
 - d. Nameplate legends.
 - e. Short-circuit current (withstand) rating of integrated unit.
 - f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.
 - g. Specified modifications.
 - 2. Detail equipment assemblies and indicate dimensions, weights, loads, method of field assembly, components, and location and size of each field connection.
 - 3. Schematic and Connection Diagrams: For power, signal, alarm, and control wiring and for pressure-sensing tubing.
- B. Qualification Data: For qualified testing agency.

- C. Product Certificates: For each type of product indicated, from manufacturer.
- D. Manufacturer's factory test reports of fully assembled and tested equipment.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For each type of product indicated to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
 - 2. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor-based logic controls.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of an NRTL.
- B. Source Limitations: Obtain fire-pump controllers and all associated equipment from single source or producer.
- C. 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.
- D. Comply with standards of authorities having jurisdiction pertaining to materials and installation.
- E. Comply with NFPA 20 and NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Ambient Temperature Rating: Not less than 40 deg F and not exceeding 122 deg F unless otherwise indicated.
 - 2. Altitude Rating: Not exceeding 6600 feet unless otherwise indicated.
- B. Interruption of Existing Electric Service: Notify Architect Construction Manager Owner no fewer than seven days in advance of proposed interruption of electric service, and comply with NFPA 70E.

1.8 COORDINATION

A. Coordinate layout and installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and

equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 FULL-SERVICE CONTROLLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Hubbell Industrial Controls.
 - 2. Joslyn Clark Corporation.
 - 3. Master Control Systems, Inc.
 - 4. Metron, Inc.
- B. General Requirements for Full-Service Controllers:
 - 1. Comply with NFPA 20 and UL 218.
 - 2. Listed by an NRTL for electric-motor driver for fire-pump service.
 - 3. Combined automatic and nonautomatic operation.
 - 4. Factory assembled, wired, and tested; continuous-duty rated.
 - 5. Service Equipment Label: NRTL labeled for use as service equipment.
- C. Method of Starting:
 - 1. Pressure-switch actuated.
 - a. Water-pressure-actuated switch and pressure transducer with independent highand low-calibrated adjustments responsive to water pressure in fire-suppression piping.
 - b. System pressure recorder, electric ac driven, with spring backup.
 - c. Programmable minimum-run-time relay to prevent short cycling.
 - d. Programmable timer for weekly tests.
 - 2. Magnetic Controller: Wye-delta (open transition) or Wye-delta (closed transition) type.
 - 3. Solid-State Controller: Reduced-voltage type.
 - 4. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.
- D. Method of Stopping: Nonautomatic.
- E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.
- F. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.
- G. Door-Mounted Operator Interface and Controls:
 - 1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.

- 2. Method of Control and Indication:
 - a. Microprocessor-based logic controller, with multiline digital readout.
 - b. Membrane keypad.
 - c. LED alarm and status indicating lights.
- 3. Local Alarm and Status Indications:
 - a. Controller power on.
 - b. Motor running condition.
 - c. Loss-of-line power.
 - d. Line-power phase reversal.
 - e. Line-power single-phase condition.
- 4. Audible alarm, with silence push button.
- 5. Nonautomatic START and STOP push buttons or switches.
- 6. Local alarm bell.
- 7. Door-mounted thermal or impact printer for alarm and status logs.
- 8. Operator Interface Communications Ports: USB, Ethernet, and RS485.

H. ATS:

- 1. Complies with NFPA 20, UL 218, and UL 1008.
- 2. Integral with controller as a listed combination fire-pump controller and power transfer switch.
- 3. Automatically transfers fire-pump controller from normal power supply to alternate power supply in event of power failure.
- 4. Allows manual transfer from one source to the other.
- 5. Alternate-Source Isolating and Disconnecting Means: Integral molded-case switch, with an externally mounted operating handle.
- 6. Alternate-Source Isolating and Disconnecting Means: Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker shall be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
- 7. Local Alarm and Status Indications:
 - a. Normal source available.
 - b. Alternate source available.
 - c. In normal position.
 - d. In alternate position.
 - e. Isolating means open.
- 8. Audible alarm, with silence push button.
- 9. Nonautomatic (manual, nonelectric) means of transfer.
- 10. Engine test push button.
- 11. Start generator output contacts.
- 12. Timer for weekly generator tests.

2.2 LIMITED-SERVICE CONTROLLERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Hubbell Industrial Controls.

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- 2. Joslyn Clark Corporation.
- 3. Master Control Systems, Inc.
- 4. Metron, Inc.
- B. General Requirements for Limited-Service Controllers:
 - 1. Comply with NFPA 20 and UL 218.
 - 2. Listed by an NRTL for electric-motor driver for fire-pump service.
 - 3. Combined automatic and nonautomatic operation.
 - 4. Factory assembled, wired, and tested; continuous-duty rated.
 - 5. Service Equipment Label: NRTL labeled for use as service equipment.
- C. Method of Starting:
 - 1. Pressure-switch actuated.
 - a. Water-pressure-actuated switch and pressure transducer with independent highand low-calibrated adjustments responsive to water pressure in fire-suppression piping.
 - b. System pressure recorder, electric ac driven, with spring backup.
 - c. Programmable minimum-run-time relay to prevent short cycling.
 - d. Programmable timer for weekly tests.
 - 2. Across-the-line magnetic controller.
 - 3. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.
- D. Method of Stopping: Nonautomatic.
- E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.
- F. Method of Isolation and Overcurrent Protection: Inverse-time, nonadjustable MCCB, with an externally mounted operating handle.
- G. Door-Mounted Operator Interface and Controls:
 - 1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
 - 2. Method of Control and Indication:
 - a. Microprocessor-based logic controller, with multiline LCD digital readout.
 - b. Membrane keypad.
 - c. LED alarm and status indicating lights.
 - 3. Local Alarm and Status Indications:
 - a. Controller power on.
 - b. Motor running condition.
 - c. Loss-of-line power.
 - d. Line-power phase reversal.
 - e. Line-power single-phase condition.

- 4. Audible alarm, with silence push button.
- 5. Nonautomatic START and STOP push buttons.
- 6. Local alarm bell.
- 7. Door-mounted thermal or impact printer for alarm and status logs.
- 8. Operator Interface Communications Ports: USB, Ethernet, and RS485.
- 9. Insert optional feature.
- H. ATS:
 - 1. Complies with NFPA 20, UL 218, and UL 1008.
 - 2. Integral with controller as a listed combination fire-pump controller and power transfer switch.
 - 3. Automatically transfers fire-pump controller from normal power supply to alternate power supply in event of power failure.
 - 4. Allows manual transfer from one source to the other.
 - 5. Alternate-Source Isolating and Disconnecting Means: Integral molded-case switch, with an externally mounted operating handle.
 - 6. Alternate-Source Isolating and Disconnecting Means: Mechanically interlocked isolation switch and circuit breaker rated at a minimum of 115 percent of rated motor full-load current, with an externally mounted operating handle; circuit breaker shall be provided with nonthermal sensing, instantaneous-only short-circuit overcurrent protection to comply with available fault currents.
 - 7. Local Alarm and Status Indications:
 - a. Normal source available.
 - b. Alternate source available.
 - c. In normal position.
 - d. In alternate position.
 - e. Isolating means open.
 - 8. Audible alarm, with silence push button.
 - 9. Nonautomatic (manual, nonelectric) means of transfer.
 - 10. Engine test push button.
 - 11. Start generator output contacts.
 - 12. Timer for weekly generator tests.

2.3 CONTROLLERS FOR DIESEL-DRIVE FIRE PUMPS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Hubbell Industrial Controls.
 - 2. Joslyn Clark Corporation.
 - 3. Master Control Systems, Inc.
 - 4. Metron, Inc.
- B. General Requirements for Controllers:
 - 1. Comply with NFPA 20 and UL 218.
 - 2. Listed by an NRTL for diesel-engine driver for fire-pump service.
 - 3. Combined automatic and nonautomatic operation.
 - 4. Factory assembled, wired, and tested.

- C. Method of Starting:
 - 1. Pressure-switch actuated.
 - a. Water-pressure-actuated switch and pressure transducer with independent highand low-calibrated adjustments responsive to water pressure in fire-suppression piping.
 - b. System pressure recorder, electric ac driven, with spring backup.
 - c. Programmable minimum-run-time relay to prevent short cycling.
 - d. Programmable timer for weekly tests.
 - 2. Dual, redundant dc-voltage battery units, with automatic changeover.
 - 3. Emergency Control: Bypasses all automatic control circuits during manual starting and running.
 - 4. Automatic engine start on loss of ac power to the controller.
- D. Method of Stopping: Nonautomatic.
- E. Door-Mounted Operator Interface and Controls:
 - 1. Monitor, display, and control devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
 - 2. Method of Control and Indication:
 - a. Microprocessor-based logic controller, with multiline LCD readout.
 - b. Membrane keypad.
 - c. LED alarm and status indicating lights.
 - 3. Local Alarm and Status Indications:
 - a. Controller power on.
 - b. Engine-lubrication-system critically low oil pressure.
 - c. Engine-jacket coolant high temperature.
 - d. Engine fail-to-start.
 - e. Engine overspeed shutdown.
 - f. Low fuel level.
 - g. Missing or failed battery.
 - h. Battery charger failure.
 - i. System overpressure.
 - j. ECM selector switch in alternate ECM position.
 - k. Fuel injector malfunction.
 - 4. Audible alarm.
 - 5. Nonautomatic START and STOP push buttons or switches.
- F. Battery Charger System:
 - 1. Built-in, independent, dual battery chargers with automatic changeover; 12-V dc or 24-V dc for nickel-cadmium batteries.
 - 2. Standard: UL 1236.

2.4 REMOTE ALARM PANELS

- A. General Requirements for Remote Alarm Panels: Comply with NFPA 20 and UL 218; listed by an NRTL for fire-pump service.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Hubbell Industrial Controls.
 - 2. Joslyn Clark Corporation.
 - 3. Master Control Systems, Inc.
 - 4. Metron, Inc.
- C. General Requirements for Remote Alarm Panels: Factory assembled, wired, and tested.
- D. Supervisory and Normal Control Voltage: 120-V ac; dual source.
- E. Audible and Visual Alarm and Status Indications:
 - 1. Driver running.
 - 2. Loss of phase.
 - 3. Phase reversal.
 - 4. Supervised power on.
 - 5. Controller connected to alternate power source.
- F. Audible and Visual Alarm and Status Indications: Manufacturer's standard indicating lights; push-to-test.
 - 1. Engine running.
 - 2. Controller main switch turned to the off or manual position.
 - 3. Supervised power on.
 - 4. Common pump room trouble.
 - 5. Controller connected to alternate power source.
- G. Audible alarm, with silence push button.
- H. Pump REMOTE START push button.

2.5 ENCLOSURES

- A. Fire-Pump Controllers, ATS, Remote Alarm Panels, and Low-Suction-Shutdown Panels: NEMA 250, to comply with environmental conditions at installed locations and NFPA 20.
 - 1. Indoor, Dry and Clean Locations: Type 1 (IEC IP10).
 - 2. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12 (IEC IP12).
- B. Enclosure Color: Manufacturer's standard "fire-pump-controller red".
- C. Nameplates: Comply with NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.

2.6 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect fire-pump controllers according to requirements in NFPA 20 and UL 218:
 - 1. Verification of Performance: Rate controllers according to operation of functions and features specified.
- B. Fire-pump controllers will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive equipment, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROLLER INSTALLATION

- A. Install controllers within sight of their respective drivers.
- B. Connect controllers to their dedicated pressure-sensing lines.
- C. Wall-Mounting Controllers: Install controllers on walls with disconnect operating handles not higher than 79 inches above finished floor, and bottom of enclosure not less than 12 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
- D. Floor-Mounting Controllers: Install controllers on 4-inch nominal-thickness concrete bases, using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches above finished floor. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete".
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.

- E. Seismic Bracing: Comply with requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- G. Comply with NEMA ICS 15.

3.3 STANDALONE ATS INSTALLATION

- A. Wall-Mounting ATS: Install ATS on walls with disconnect operating handles not higher than 79 inches above finished floor, and bottom of enclosure not less than 12 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For ATS not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
- B. Floor-Mounting ATS: Install ATS on 4-inch nominal-thickness concrete bases, using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches above finished floor. Comply with requirements for concrete bases specified in Division 03 Section "Cast-in-Place Concrete".
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- C. Seismic Bracing: Comply with requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.4 REMOTE ALARM PANEL INSTALLATION

A. Install panels on walls with tops not higher than 72 inches above finished floor unless otherwise indicated. Bolt units to wall or mount on lightweight structural-steel channels bolted to wall. For ATS not on walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."

3.5 POWER WIRING INSTALLATION

A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in NFPA 20, NFPA 70, and Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.6 CONTROL AND ALARM WIRING INSTALLATION

- A. Install wiring between controllers and remote devices. Comply with requirements in NFPA 20, NFPA 70, and Division 26 Section "Control-Voltage Electrical Power Cables."
- B. Install wiring between remote alarm and low-suction-shutdown panels and controllers. Comply with requirements in NFPA 20, NFPA 70, and Division 26 Section "Control-Voltage Electrical Power Cables."
- C. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Division 28 Section "Digital, Addressable Fire-Alarm System."
- D. Bundle, train, and support wiring in enclosures.
- E. Connect remote manual and automatic activation devices where applicable.

3.7 IDENTIFICATION

- A. Comply with requirements in NFPA 20 for marking fire-pump controllers.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in NFPA 20 and as specified in Division 26 Section "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. 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.
- D. Acceptance Testing Preparation:
 - 1. Inspect and Test Each Component:
 - a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.
 - b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
 - c. Test continuity of each circuit.
 - 2. Verify and Test Each Electric-Driver Controller:
 - a. Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for any motor, notify Construction Manager before starting the motor(s).
 - b. Test each motor for proper phase rotation.

- 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
- 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Field Acceptance Tests:
 - 1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Construction Manager and authorities having jurisdiction.
 - 2. Prior to starting, notify authorities having jurisdiction of the time and place of the acceptance testing.
 - 3. Engage manufacturer's factory-authorized service representative to be present during the testing.
 - 4. Perform field acceptance tests as outlined in NFPA 20.
- F. Controllers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.

3.9 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.10 ADJUSTING

- A. Adjust controllers to function smoothly and as recommended by manufacturer.
- B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.
- C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.
- D. Set field-adjustable pressure switches.

3.11 **PROTECTION**

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.
- B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controllers, remote alarm panels.

END OF DOCUMENT 21 3900