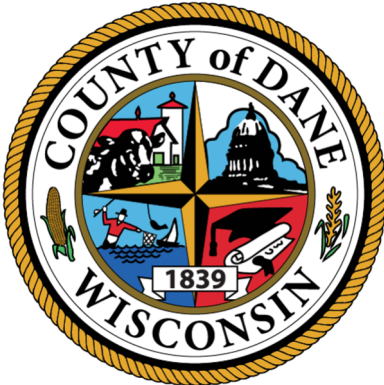



PROJECT MANUAL

CITY OF MADISON AND DANE COUNTY BARTILLON SHELTER – VOLUME 1

Madison, Wisconsin
March 1, 2024



<p>PUBLIC IMPROVEMENT PROJECT APPROVED:</p> <p>RES – 23 – 00737</p> <p>FILE ID 80752</p> <p>DATE December 5, 2023</p> <p>BY THE COMMON COUNCIL OF MADISON, WI</p>	<p>PUBLIC IMPROVEMENT DESIGN APPROVED BY:</p> <p></p> <hr/> <p>CITY ENGINEER</p> <p>March 1, 2024</p> <hr/> <p>DATE</p>
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PROJECT MANUAL TITLE PAGE

PROJECT **CITY OF MADISON AND DANE COUNTY – BARTILLON SHELTER**
1904 BARTILLON DRIVE
MADISON, WISCONSIN 53704

OWNER: **CITY OF MADISON AND DANE COUNTY PARTNERSHIP**
251 MARTIN LUTHER KING JR. BLVD.
MADISON, WISCONSIN 53703

OWNER'S REPRESENTATIVE: **JONATHAN EVANS**
Email: Jevans@cityofmadison.com
Phone: 608.243.5893

ARCHITECTURE: **DIMENSION IV MADISON DESIGN GROUP**
Project Manager: Carl Miller
608.829.4457
cmiller@dimensionivmadison.com
Project Architect: Jim Gersich
608.829.4453
jgersich@dimensionivmadison.com
6515 Grand Teton Plaza, Suite 120
Madison, Wisconsin 53719

CIVIL ENGINEERING: **SNYDER AND ASSOCIATES**
5010 Voges Road
Madison, Wisconsin 53718
Contact: Scott Anderson / 608.838.0444 / sanderson@snyder-associates.com

STRUCTURAL ENGINEERING: **ONEIDA TOTAL INTEGRATED ENTERPRISES**
1033 North Mayfair Road, Suite 200
Milwaukee, Wisconsin 53226
Contact: James Hall / 608.241.6717 / jhall@oesgroup.com

MECHANICAL, ELECTRICAL, PLUMBING
AND FIRE PROTECTION: **IBC ENGINEERING**
N8 W22195 Johnson Dr., Suite 180
Waukesha, Wisconsin 53186
Contact: Colleen Hoffman / 262.522.4432 / colleenh@ibcengineering.com

TECHNOLOGY, SECURITY DESIGN: **CONVERGENT TECHNOLOGIES DESIGN GROUP**
448 W. 37th Street, 7D
New York, NY 10018
Contact: Ajinkya Patil / 646.475.5116 / apatil@ctdginc.com

FOOD AND LAUNDRY DESIGN: **STEWART DESIGN ASSOCIATES**
5325 Wall Street, Suite 2600
Madison, Wisconsin 53718
Contact: Rock Deering / 608.271.8554 / rock@stewdesign.com

LEED AND SUSTAINABILITY: **HABLAB**
Madison, Wisconsin 53703
Contact: Graham Linn / 608.447.8108 / graham@hablab.llc

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**SECTION 00 31 46
PERMITS**

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11 **PART 1 – GENERAL**

12
13 **1.1. SUMMARY**

- 14 A. Each project has varying requirements for permits, inspections, and fees based on the scope, size, and location
15 of the project.
16 B. The City of Madison (Owner) is subject to all permits, inspections and associated fees for construction,
17 demolition, utility connection, storm water management, and other similar requirements that may be required
18 to complete the scope of work associated with these contract documents.
19 C. The General Contractor (GC) shall be responsible for obtaining all permits, inspections and paying for all
20 associated fees unless specifically identified within this specification.
21

22 **1.2. REFERENCES**

- 23 A. The following references are not intended to be all inclusive. It shall be the GC’s responsibility to determine all
24 requirements based on the scope of work in the contract documents.
25 B. City of Madison Ordinances: Review all ordinances that may require a permit or fee that may be connected with
26 a required permit. Contact the following City Agencies to determine the exact requirements during bidding
27 1. Building Inspection
28 2. Zoning
29 3. Engineering
30 4. Water Utility
31 5. Traffic Engineering
32 6. Others as may be specified by the contract documents.
33 B. State Statutes
34 C. Other Regulatory Regulations
35 D. Other Agencies or companies that may have related requirements
36 1. Madison Metropolitan Sewerage District
37 2. Local gas and electric utility companies
38 3. Other utility companies
39

40 **1.3. GENERAL CONTRACTORS REQUIREMENTS**

- 41 A. The GC shall be responsible for all of the following:
42 1. Execute application for all required permits as may be required by the scope of work described within the
43 contract documents.
44 2. Scheduling all required inspections that may be conditions of any required permits.
45 3. Paying for other permits not explicitly stated as excluded in this section.
46 B. The GC is not responsible for paying for the City Building, City HVAC, City Electrical, City Plumbing, Madison Fire
47 Department Sprinkler and Madison Fire Department Fire Alarm permits.
48 C. The GC shall provide high quality scanned images of all required permits and inspections and upload them to the
49 Contract Documents-Regulatory Documents Library on the Project Management Web Site.
50

51 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

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53 **PART 3 – EXECUTION – THIS SECTION NOT USED**

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57 **END OF SECTION**
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**SECTION 00 43 25
SUBSTITUTION REQUEST FORM (DURING BIDDING)**

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PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will not allow substitutions for specified Products except as follows:
20 1. The Product is no longer produced or the product manufacturer is no longer in business.
21 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
22 criteria for the specified Product(s).
23 3. Products specified by naming one or more Products or manufacturer’s and “or approved equal” or
24 “approved equivalent.”
25 C. The procedures in this specification shall apply to all proposals by Contractors, Suppliers, Vendors, and
26 Manufacturers when the conditions in item 1.1.B. above have been met during the bidding phase.
27

1.2. RELATED SPECIFICATIONS

- 29 A. 01 25 13 Product Substitution Procedures
30

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

- 36 A. In the event that a substitution is requested during the bidding phase the Contractor, Supplier, Vendor, or
37 Manufacturer shall do all of the following:
38 1. Submit a Substitution Request Form for each different product. Use a printed/scanned copy of the form
39 at the end of this specification as a cover sheet.
40 2. Support your request with complete data, drawings, specifications, performance data and samples as
41 appropriate. A complete submission shall include the following:
42 a. Substitution Request Form as a cover sheet
43 b. Comparison of qualities of the proposed substitutions with that specified.
44 c. Changes required in other elements of the Work because of the substitution.
45 d. Effect on the construction schedule.
46 e. Cost data comparing the proposed substitution with the Product specified.
47 f. Any required license fees or royalties.
48 g. Availability of maintenance service and source of replacement materials.
49 3. Submit the Substitution Request Form and all required supporting documentation to the City Project
50 Manager and Project Architect.
51 a. Submissions to be done as complete PDF files for each product, appropriately titled
52 b. Email submissions to the Project Architect and City Project Manager at the email addresses
53 provided on the last page of Section D of the contract documents.
54 i. The subject line shall include the contract number and “Request for Substitution”.
55 Example: Contract 1234 – Request for Substitution
56 4. Submissions must be received by the substitution request deadline specified in Section A of the Contract
57 Documents.
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3.2. SUBMISSION REVIEW

- A. The Project Architect, City Project Manager, members of the design team, and the Owners staff shall review all submissions for substitutions during the bidding phase.

3.3. SUBSTITUTION APPROVAL

- A. All requests for substitutions that have been approved shall be published by Addenda to the bid documents.

NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.

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3.4. SUBSTITUTION REQUEST FORM

For Pre-bid Substitution Requests all text boxes on this form are required information for a complete request.

	<h1>Substitution Request</h1>
Today's Date:	<input type="text"/>
Project Title:	<input type="text"/>
Project Number:	<input type="text"/>
Contract Number:	<input type="text"/>
<p><i>By completing and submitting this form for review the General Contractor affirms that all of the following statements are correct:</i></p> <ol style="list-style-type: none"><i>The General Contractor affirms that this request is in compliance with the requirements described in Specification 01 25 13 Product Substitution Procedures.</i><i>The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.</i><i>The proposed substitution does not affect dimensions shown on the drawings.</i><i>The proposed substitution will have no adverse affects on other trades, the construction schedule, or any specified warranty requirements.</i><i>Maintenance and service parts will be locally available for the proposed substitution. (GC shall provide supporting documentation in the attachments section below.)</i><i>The General Contractor shall be responsible for any and all costs associated with this substitution request if approved. This includes but is not to limited to fees for building design, engineering design fees, detailing fees, plan review fees, construction costs, and inspection fees.</i>	
<u>GC Substitution Request:</u>	
General Title:	<input type="text"/>
Related Specification:	<input type="text"/> <input type="text"/> <input type="text"/>
Reason for Substitution:	<input type="text"/>
Proposed Substitution: (include Name, Model, etc.)	<input type="text"/>
Submitted By:	<input type="text"/>
Company:	<input type="text"/>
Phone:	<input type="text"/>
Email:	<input type="text"/>

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**SECTION 00 43 43
WAGE RATES FORM**

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PART 3 - EXECUTION1
3.1. GENERAL REQUIREMENTS.....1
3.2. GENERAL CONTRACTORS RESPONSIBILITIES1

PART 1 – GENERAL

1.1. SUMMARY

- A. The Reimbursable Hourly Worksheet is a contractor provided document that indicates the basic rate of pay, fringe benefits, and each companies cost of required insurance for all Trades and Classifications that will be performing productive labor during the execution of this contract.
 - 1. Rates shall be similar to recognized rates published by the Bureau of Labor Statistics, Associated General Contractors (AGC), Associated Builders and Contractors (ABC), appropriate union contracts, and other similar organizations or documents.
- B. The Reimbursable Labor Rate Worksheet shall provide the basis for labor rates being used on Change Order Request forms.

1.2. RELATED SPECIFICATIONS

- A. Section 01 26 57 Change Order Request
- B. Section 01 29 76 Progress Payment Procedures
- C. Section 01 31 23 Project Management Web Site (PMWS)
- D. Section 01 32 19 Submittals Schedule

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- A. Prior to the Pre-Construction Meeting the City Project Manager (CPM) or the City Construction Manager (CCM) shall provide the GC a copy of the *Reimbursable Labor Rate Worksheet.xls*.
 - 1. See the last page of this specification for an example of the worksheet.
- B. The GC shall provide all subcontractors that will be performing productive labor during the execution of this contract with additional copies of the worksheet as needed.
- C. All contractors shall be required to fill out and submit completed worksheets for all Trades and Classifications of labor that will be performing productive labor during the execution of this contract.

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

- A. The GC shall consolidate all Trades and Classifications into one master Excel Workbook of all trades.
- B. The GC shall provide the combined workbook as required by Section 1.6 of Specification 01 32 19 Submittals Schedule for review and approval by the Owners Representatives.
 - 1. Submittal shall be an Exported PDF of the completed Excel Workbook.
 - a. As an Exported PDF the individual worksheets will be bookmarked and the document will be word searchable for easy reference.
- C. The GC shall only use the rates posted in the approved submittal throughout the execution of this contract.

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Reimbursable Hourly Rate Worksheet

(see bottom of page for instructions)

Project Name: _____
 Project Location: _____
 Project Number: _____
 Contractor: _____
 Rates are based on the following documentation: _____

Enter TRADE Here:

Carpenter

<u>Classification:</u>		<u>Foreman</u>	<u>Journeyman</u>	<u>Laborer</u>	<u>Apprt 1</u>	<u>Other</u>	<u>Other</u>	<u>Other</u>
Base Rate (BR)		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Vacation		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Health Insurance		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Pension		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Apprenticeship		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<i>Sub-total</i>		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
BR Sub-total		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Work. Comp	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Gen Liability	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
WI Unemploy	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Fed Unemploy	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
FICA	% of BR	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<i>Sub-total</i>		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL COST		\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Enter YOUR percentage of base rate in the column below.

0	- Work. Comp
0	- Gen Liability
0	- WI Unemploy
0.6	- Fed Unemploy
7.65	- FICA

Form Instructions:

1. Provide a work sheet for ALL Trade Classifications that will be performing on site productive labor during the execution of this project.
2. Responsible contractor to complete only boxes that are shaded, all non-shaded boxes are formula driven.
3. Contractor shall provide the name of the source used for these rates. (union contract, Bureau of Labor and Statistics, AGC, ABC, etc.) and be prepared to provide copies if so requested.

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END OF SECTION

**SECTION 00 62 76.13
SALES TAX FORM**

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PART 1 – GENERAL1
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1.2. RELATED SPECIFICATION SECTIONS1
1.2. TAX EXEMPT FORM1
PART 2 – PRODUCTS – THIS SECTION NOT USED1
PART 3 – EXECUTION – THIS SECTION NOT USED1

PART 1 – GENERAL

1.1. SUMMARY

- A. The City of Madison is a qualifying tax exempt entity in the State of Wisconsin.
- B. The Contractor shall refer to *Section 102.9 – Bidders Understanding of the City of Madison FACILITIES MANAGEMENT SPECIFICATIONS for Public Works Construction* for more information on Tax Exempt Status.
- C. This project constructs or remodels facilities owned by the City of Madison in Madison, Wisconsin.

1.2. RELATED SPECIFICATION SECTIONS

- A. Parts of this specification will reference articles within “The City of Madison FACILITIES MANAGEMENT SPECIFICATIONS for Public Works Construction”.
 - 1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONS web page:
<http://www.cityofmadison.com/business/pw/specs.cfm>
 - a. Click on the “Part” chapter identified in the specification text. For example if the specification says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2” click the link for Part II, the Part II PDF will open.
 - b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you to the referenced text.

1.3. TAX EXEMPT FORM

- A. The Contractor can access Wisconsin Sales and Use Tax Exemption Certificates (form S-211, Wisconsin Department of Revenue) from the City of Madison Finance website.
 - 1. City of Madison tax exempt information and signature by Purchasing Supervisor is already completed.
 - 2. Website: <http://www.cityofmadison.com/employeenet/finance/purchasing>
 - a. Under the title *Purchasing Forms*, scroll down to the form link titled *Sales Tax Exempt Form S-211*.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

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**SECTION 01 23 00
ALTERNATES**

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Photovoltaic system scope of work.
 - 1. Base Bid: Provide conduit, meters, and panelboards for solar photovoltaic system as well as a roof structure capable of accommodating the additional load as indicated on Drawing E203A and E203B and as specified in Section 26 31 00 "Photovoltaic System Performance Requirements."
 - 2. Alternate: Provide wiring, inverters, photovoltaic solar panels, and ballasted racking as indicated on Drawing E203A and E203B and as specified in Section 26 31 00 "Photovoltaic System Performance Requirements."
- B. Alternate No. 2: Installation of Multiuse Path along eastside of 1904 Bartillon Drive and 3709 Kinsman Blvd.
 - 1. Base Bid: None
 - 2. Alternate: Provide installation as detailed in Exhibit E.
- C. Alternate No. 3: Demolition of 3709 Kinsman Blvd Building and Site.
 - 1. Base Bid: None
 - 2. Alternate: Provide demolition as detailed in Exhibit D.

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SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

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14 **PART 1 – GENERAL**

15
16 **1.1. SUMMARY**

- 17 A. The City of Madison uses a specific list of preferred products for various specification items to establish
18 standards of quality, utility, and appearance required.
19 B. The City of Madison will not allow substitutions for specified Products except as follows:
20 1. The Product is no longer produced or the product manufacturer is no longer in business.
21 2. The manufacturer has significantly changed performance data, product dimensions, or other such design
22 criteria for the specified Product(s).
23 3. Products specified by naming one or more Products or manufacturer’s and “or approved equal” or
24 “approved equivalent.”
25 C. The City of Madison will not allow substitutions for specified Products as follows:
26 1. For Products specified by naming only one Product and manufacturer, no substitute product will be
27 considered.
28 2. For Products specified by naming several Products or manufacturers select any one of the products or
29 manufacturers named, which complies with the specifications. No substitute product will be considered.
30 D. Request for substitutions from any party other than the General Contractor (GC) will not be accepted.
31

32 **1.2. RELATED SPECIFICATIONS**

- 33 A. Section 00 43 25 Substitution Request Form (During Bidding)
34 B. Section 01 26 13 Request for Information (RFI)
35 C. Section 01 31 23 Project Management Web Site (PMWS)
36 D. Section 01 33 23 Submittals
37

38 **PART 2 – PRODUCTS**

39
40 **2.1. SUBSTITUTION REQUEST FORM**

- 41 A. During bidding all contractors (General and Sub-contractors) and suppliers of materials or products shall
42 reference Specification Section 00 43 25 and provide a pdf copy of the Substitution Request form located at the
43 end of that section with all required attachments directly to the Project Architect.
44 B. After bidding only the GC shall submit a request and shall use the form located at the end of this specification
45 and submit the request on the Project Management Web Site.
46

47 **PART 3 - EXECUTION**

48
49 **3.1. REQUESTING A SUBSTITUTION DURING BIDDING**

- 50 A. In the event that a substitution is requested during the bidding phase the Contractor or Supplier shall meet the
51 substitution request deadline listed in the bidding documents. No substitution request will be considered during
52 the bidding period after the stated substitution request deadline.
53 B. See specification 00 43 25 Substitution Request Form (During Bidding).
54

55 **3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT**

- 56 A. A substitution request will only be considered after award of contract if it meets the qualifying provisions as
57 described in 1.1.B.1 and .2 above.
58 B. The GC shall submit a substitution request using the digital form on the Project Management Web Site.

1. Consulting Staff, Owner and Owners Representatives will review the request and provide the appropriate approvals and feed back to the GC.

3.3. UNAUTHORIZED SUBSTITUTIONS

- A. Any Contractor who substitutes products without proper authorization by the Owner and Architect will be required to immediately remove and replace the product and all costs required to conform to the Contract Documents shall be borne by the General Prime Contractor.

NOTE SEE NEXT PAGE FOR SAMPLE SUBSTITUTION REQUEST FORM.

1

For Pre-bid Substitution Requests all text boxes on this form are required information for a complete request.

	<h1>Substitution Request</h1>
Today's Date:	<input type="text"/>
Project Title:	<input type="text"/>
Project Number:	<input type="text"/>
Contract Number:	<input type="text"/>
<p>By completing and submitting this form for review the General Contractor affirms that all of the following statements are correct:</p> <ol style="list-style-type: none">1 The General Contractor affirms that this request is in compliance with the requirements described in <i>Specification 01 25 13 Product Substitution Procedures</i>.2 The function, appearance, and quality of the proposed substitution are equal or superior to the specified item.3 The proposed substitution does not affect dimensions shown on the drawings.4 The proposed substitution will have no adverse affects on other trades, the construction schedule, or any specified warranty requirements.5 Maintenance and service parts will be locally available for the proposed substitution. (GC shall provide supporting documentation in the attachments section below.)6 The General Contractor shall be responsible for any and all costs associated with this substitution request if approved. This includes but is not to limited to fees for building design, engineering design fees, detailing fees, plan review fees, construction costs, and inspection fees.	
GC Substitution Request:	
General Title:	<input type="text"/>
Related Specification:	<input type="text"/> <input type="text"/> <input type="text"/>
Reason for Substitution:	<input type="text"/>
Proposed Substitution: (include Name, Model, etc.)	<input type="text"/>
Submitted By:	<input type="text"/>
Company:	<input type="text"/>
Phone:	<input type="text"/>
Email:	<input type="text"/>

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**SECTION 01 26 13
REQUEST FOR INFORMATION (RFI)**

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15		

PART 1 – GENERAL

1.1. SUMMARY

- A. Contractors shall use the RFI form/process to request additional information or clarification regarding the construction documents.
- B. All RFI documentation will be processed through the through the Project Management Web Site (PMWS).

1.2. RELATED SPECIFICATIONS

- A. Section 01 26 46 Construction Bulletin (CB)
- B. Section 01 26 57 Change Order Request (COR)
- C. Section 01 26 63 Change Order (CO)
- D. Section 01 31 23 Project Management Web Site (PMWS)
- E. Section 01 91 00 Commissioning

1.3. PERFORMANCE REQUIREMENTS

- A. RFI issues initiated by any contractor shall be done through the General Contractor (GC).
 - 1. RFIs submitted by any Sub-contractor under the GCs control shall be returned with no response.
- B. Submit a new RFI for each issue. Only multiple questions that are of a similar nature may be combined into one RFI shall be allowed and responded to.

1.4. QUALITY ASSURANCE

- A. The GC shall be responsible for all of the following:
 - 1. Ensure that any request for additional information is valid and the information being requested is not addressed in the construction documents.
 - 2. Ensure that all requests are clearly stated and the RFI form is completely filled out.
 - 3. Ensure that all Work associated an RFI response is carried out as intended.
- B. The Project Architect /Project Engineer (A/E PROJ MGR) shall be responsible for the following:
 - 1. Ensure that all responses to contractor initiated RFIs are properly responded to in a timely fashion.
 - a. The CPM, Owner, consulting staff, and other City staff shall be responsible for the initial review of the RFI. The A/E PROJ MGR shall be responsible for codifying all consultant and Owner/City staff comments into a unified RFI response.

PART 2 – PRODUCTS

2.1. REQUEST FOR INFORMATION FORM

- A. The RFI form is located on the Project Management Web Site.

PART 3 - EXECUTION

3.1. CONTRACTOR INITIATED RFI

- A. Immediately on discovery of the need for additional information or interpretation of the Contract Documents any contractor may initiate an RFI for additional information or clarification through the GC.
- B. The GC shall use the Project Management Web Site and completely fill out the form.

- 1 1. Thoroughly explain the issue at hand, provide backup information (photographs, sketches, drawings,
2 data, etc.) as necessary, and clearly state the question or problem that requires a resolution. Combine
3 like or related issues but do not include multiple issues on one form.
4 a. Example. If a duct interferes with other critical piping and electrical work include all issues into
5 one RFI.
6 b. Example. If you have a question regarding the chiller and another regarding toilet partitions
7 create separate RFIs.
8

9 **3.3. RFI RESPONSES**

- 10 A. Responses to simple RFI issues shall be completed within five (5) working days of the RFI form being submitted.
11 B. Responses to more complex issues may require additional time or may require a Construction Bulletin to be
12 published. The initial RFI shall be responded to within five (5) working days stating that the RFI is being
13 reviewed and provide an estimated date for the response.
14 C. The following GC generated RFIs will be returned without action:
15 1. Requests for approval of submittals
16 2. Requests for approval of substitutions
17 3. Requests for approval of Contractor's means and methods.
18 4. Requests for coordination information already indicated in the Contract Documents.
19 5. Requests for adjustments in the Contract Time or the Contract Sum.
20 6. Requests for interpretation of A/E's actions on submittals.
21 7. Incomplete RFI or inaccurately prepared RFI.
22

23 **3.4. COMMENCEMENT OF WORK RELATED TO AN RFI**

- 24 A. The GC shall only proceed with the Work of an RFI when additional information is not required.
25 B. The GC shall not proceed with any Work associated with an RFI while it is under review.
26 C. The GC shall not proceed with any Work associated with an RFI that clearly states a CB will be issued in response
27 to the RFI.
28 D. The GC will be required to immediately remove and replace unauthorized Work and all costs required to
29 conform to the Contract Documents shall be borne by the GC.
30
31
32

33 **END OF SECTION**
34
35

**SECTION 01 26 46
CONSTRUCTION BULLETIN (CB)**

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14

PART 1 – GENERAL

1.1. SUMMARY

- 18 A. Construction Bulletins (CB) are formal published construction documents that modify the original contract bid
19 documents after construction has commenced. CBs may be published for many reasons, including but not
20 limited to the following:
21 1. Clarification of existing construction documents including specifications, plans, and details
22 2. Change in product or equipment
23 3. A response to a Request for Information
24 4. Change in scope of the contract as either an add or a deduct of work
25 B. CBs provide a higher degree of detail in response to a Request for Information (RFI) through directives, revised
26 plans/details, and specifications as necessary.
27 C. The CB may change the original contract documents through additions or deletions to the Work.
28 D. Where the directives of a CB are significant enough to warrant a Change Order Request (COR) the GC shall use all
29 information provided in the CB to assemble all required back-up documentation for additions and deletions of
30 materials, labor and other related contract costs for the COR.
31 E. All CB documentation will be processed through the Project Management Web Site (PMWS).
32

1.2. RELATED SPECIFICATIONS

- 34 A. Section 01 26 13 Request for Information (RFI)
35 B. Section 01 26 57 Change Order Request (COR)
36 C. Section 01 26 63 Change Order (CO)
37 D. Section 01 31 23 Project Management Web Site (PMWS)
38 E. Section 01 91 00 Commissioning
39

1.3. PERFORMANCE REQUIREMENTS

- 41 A. Project Architect /Project Engineer (A/E PROJ MGR): The A/E PROJ MGR shall be the only person authorized to
42 publish a CB as needed for any reason indicated in section 1.1.A above. The A/E PROJ MGR shall consult as
43 necessary with any of the following while drafting the CB and shall confirm final direction with the CPM prior to
44 issuing a CB:
45 1. City Project manager (CPM)
46 2. Owner
47 3. Members of the consulting staff
48 4. Members of city staff
49 5. The General Contractor
50 6. Sub-contractors
51 7. Commissioning Agent (CxA)
52 B. General Contractor: The GC shall be responsible for the following as needed:
53 1. Executing the directives of the CB when they believes that no changes in labor, materials, equipment, or
54 contract duration will be required for additions or deletions.
55 2. Submit a COR when they believes that a change in labor, materials, equipment or contract duration will
56 be required for additions or deletions.
57

1 **1.4. QUALITY ASSURANCE**

- 2 A. The A/E PROJ MGR shall be responsible for ensuring the final CB sufficiently provides direction, details,
3 specifications and other information as necessary for the GC to perform the intended Work.
4 B. The A/E PROJ MGR shall be responsible for ensuring the final CB is published as expeditiously as practical based
5 on the complexity of the CB being written. CBs that may affect the GC critical path shall be given priority.
6

7 **PART 2 – PRODUCTS**

8
9 **2.1. CONSTRUCTION BULLETIN FORM**

- 10 A. The CB form is located on the Project Management Web Site.
11

12 **PART 3 - EXECUTION**

13
14 **3.1. WRITING THE CONSTRUCTION BULLETIN**

- 15 A. The A/E PROJ MGR shall draft a CB as needed using the Construction Bulletin form on the Project Management
16 Web Site.
17 1. The A/E PROJ MGR and/or consulting staff as necessary shall provide specifications, model numbers and
18 performance data, details and other such information necessary to clearly state the intentions of the CB.
19 2. The consulting staff, CPM, Owner, CxA and other City Staff shall review the draft and recommend
20 changes as needed.
21 3. The A/E PROJ MGR shall amend the draft as necessary into a final CB for review.
22 4. Full plan sheets and entire specification sections referred to within a CB, shall be reissued with the CB.
23 B. Once the final CB has been approved the A/E PROJ MGR shall “Submit” the CB through the Project Management
24 Web Site to the City Project Manager.
25 C. The City Project Manager will close and distribute the CB.
26

27 **3.2. EXECUTING THE CONSTRUCTION BULLETIN**

- 28 A. The GC shall acknowledge receipt of the CB on the Project Management Web Site as instructed in the Tutorial
29 Manual provided to the awarded contractor.
30 B. The GC shall notify all Sub-contractors of the CB and publish the CB to all field sets of drawings and specifications
31 as appropriate.
32 C. The GC shall execute the directives of the CB or submit COR documentation as necessary during the execution
33 and implementation of the CB.
34 1. See Specification 01 26 57 Change Order Request (COR)
35
36
37

38 **END OF SECTION**
39

SECTION 01 26 57
CHANGE ORDER REQUESTS (COR)

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18 3.4. EMERGENCY CHANGE ORDER REQUEST 5

PART 1 – GENERAL

1.1. SUMMARY

- 23 A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made
24 by the General Contractor (GC) without having prior approval of the City Engineer or their representative.
25 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
26 the Work by written Change Order (CO). Such changes may include additions and/or deletions.
27 C. Where the City desires to make changes in the Work through use of written Change Order Request (COR), the
28 following procedures apply:
29 1. If requested by the City, the GC shall prepare and submit a detailed proposal, including all cost and time
30 adjustments to which the GC believes it will be entitled if the change proposed is incorporated into the
31 Contract. The City shall be under no legal obligation to issue a Change Order for such proposal.
32 2. The parties shall attempt in good faith to reach agreement on the adjustments needed to the Contract to
33 properly incorporate the proposed change(s) into the Work. In the event that the parties agree on such
34 adjustments, the City may issue a Change Order and incorporate such changes and agreed to
35 adjustments, if any.
36 3. In some instances, it may be necessary for the City to authorize Work or direct changes in Work for which
37 no final and binding agreement has been reached and for which unit prices are not applicable. In such
38 cases the following shall apply.
39 a. Upon written request by the City, the GC shall perform proposed Work
40 b. The cost of such change may be determined in accordance with this specification.
41 c. In the event agreement cannot be accomplished as contemplated herein, the City may authorize
42 the Work to be performed by City forces or to hire others to complete the Work. Such action on
43 the part of the City shall not be the basis of a claim by the GC for failure to allow it to perform the
44 changed Work.
45 D. Where changes in the Work are made by the City through use of a force account basis, the GC shall as soon as
46 practicable, and in no case later than ten (10) working days from the receipt of such order, unless another time
47 period has been agreed to by both parties, give the City written Notice, stating:
48 1. The date, circumstances and source of the extra work; and,
49 2. The cost of performing extra work described by such Order, if any; and,
50 3. Effect of the order on the required completion date of the Project, if any.
51 E. The giving of each Notice by the GC as prescribed by this specification, shall be a requirement to liability of the
52 City for payment of any additional costs incurred by the GC in implementing changes in the Work. Under this
53 specification, no order or statement of the City shall be treated as a Change Order, or shall entitle the GC to an
54 equitable adjustment of the terms of this Contract or damages for costs incurred by the GC on any activity for
55 which the Notice was not given.
56 F. In the event Work is required due to an emergency as described in this specification the GC must request an
57 equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
58 commencement of such emergency.

- 1 G. All GC requests for equitable adjustment shall be submitted to the CPM per the specifications below. Such
- 2 requests shall set forth with specificity the amount of and reason(s) for the proposed adjustment and shall be
- 3 accompanied by supporting information and documents.
- 4 H. No adjustment of any kind shall be made to this Contract, if asserted by the GC for the first time, after the date
- 5 of final payment.
- 6 I. This specification shall be used by the GC when preparing documentation for any COR to ensure each has been
- 7 properly and completely filled out as required by the City of Madison.
- 8 J. All COR documentation will be processed through the Project Management Web Site (PMWS).
- 9

10 **1.2. RELATED SPECIFICATION SECTIONS**

- 11 A. Section 01 26 13 Request for Information (RFI)
- 12 B. Section 01 26 46 Construction Bulletins (CB)
- 13 C. Section 01 26 63 Change Order (CO)
- 14 D. Section 01 31 23 Project Management Web Site (PMWS)
- 15 E. Section 01 91 00 Commissioning
- 16 F. Parts of this specification will reference articles within “The City of Madison FACILITIES MANAGEMENT
- 17 SPECIFICATIONS for Public Works Construction”.
- 18 1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONS web page:
- 19 <http://www.cityofmadison.com/business/pw/specs.cfm>
- 20 a. Click on the “Part” chapter identified in the specification text. For example if the specification
- 21 says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2” click the link for
- 22 Part II, the Part II PDF will open.
- 23 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
- 24 to the referenced text.
- 25

26 **1.3. DEFINITIONS AND STANDARDS**

- 27 A. LABOR: The amount of time and cost associated with the performance of human effort for a defined scope of
- 28 Work. Labor is further defined as follows:
- 29 1. Labor rate is the total hourly rate which includes the basic rate of pay, fringe benefits plus each
- 30 company’s cost of required insurance, also referred to as a reimbursable labor rate.
- 31 2. Unit labor is the labor hours anticipated to install the corresponding unit of material.
- 32 3. Labor cost is the labor hours multiplied by the hourly labor rates.
- 33 B. MATERIAL: Actual material cost is the amount paid, or to be paid, by the GC for materials, supplies and
- 34 equipment entering permanently into the Work, including cost of transportation and applicable taxes. The cost
- 35 shall not exceed the usual and customary cost for such items available in the geographical area of the project
- 36 C. LARGE TOOLS AND MAJOR EQUIPMENT: Large tools and major equipment are those with an initial cost greater
- 37 than \$1,500, whether from the GC or other sources.
- 38 1. Tool and equipment use and time allowed is only for extra work associated with change orders.
- 39 a. Rental Rate is the machine cost associated with operating a piece of equipment for a defined
- 40 length of time (hour, day, week, or month) and shall not exceed the usual and customary amount
- 41 for such items available in the geographical area of the project.
- 42 b. Rental cost is the rental rate multiplied by the anticipated duration the equipment shall be
- 43 required.
- 44 2. The GC shall provide a breakdown of all rental rates to indicate what items and costs are associated with
- 45 the rate. Examples of items to include in the breakdown would be fuel consumption, lubrication,
- 46 maintenance and other similar expenses but not including profit and overhead.
- 47 3. When large tools and equipment needed for Change Order work are not already at the job site, the
- 48 actual cost to get the item there is also reimbursable.
- 49 D. BOND COST: The cost shall be calculated at 1% of the total proposed change order.
- 50 E. SUB-CONTRACTOR COSTS: Sub-contractor costs are for those labor, material, and equipment costs required by
- 51 subcontracted specialties to complete the Change Order work.
- 52 F. OVERHEAD AND PROFIT Markup: The allowable markup percentage to a COR by the GC and Sub-contractors for
- 53 overhead and profit. All of the following are expenses associated with overhead and profit and shall not be
- 54 reimbursable as individual items on any COR:
- 55 1. CHANGE ORDER PREPARATION: All costs associated with the preparing and processing of the change
- 56 order.
- 57 2. DESIGN, ESTIMATING, AND SUPERVISION: All such efforts, unless specifically requested by Owner as
- 58 additional Work to be documented as a COR or portion thereof.

- 1 3. INSTALLATION LAYOUT: The layout required for the installation of material and equipment, and the
- 2 installation design, is the responsibility of the GC.
- 3 4. SMALL TOOLS AND SUPPLIES: The cost of small hand tools with an initial cost of \$1,500 or less, along
- 4 with consumable supplies and expendable items such as drill bits, saw blades, gasoline, lubricating or
- 5 cutting oil, and similar items.
- 6 5. GENERAL EXPENSE: The general expense, which is those items that are a specific job cost not associated
- 7 with direct labor and material such as job trailers, foreman truck, and similar items.
- 8 6. RECORD DRAWINGS: The preparation of record or as-built drawings.
- 9 7. OTHER COSTS: Any miscellaneous cost not directly assessable to the execution of the Change Order
- 10 including but not limited to the following:
- 11 a. All association dues, assessments, and similar items.
- 12 b. All education, training, and similar items.
- 13 c. All drafting and/or engineering, unless specifically requested by Owner as additional Work to be
- 14 documented as a Change Order proposal or portion thereof.
- 15 d. All other items including but not limited to review, coordination, estimating and expediting, field
- 16 and office supervision, administrative work, etc.
- 17 G. Contract Extension: The necessary amount of time to be added to the contract deadlines for the completion of a
- 18 change order.
- 19

20 **1.4. CONTRACT EXTENSION**

- 21 A. The GC shall not assume that every COR will require a Contract Extension. If the GC feels a contract extension is
- 22 warranted, they shall provide sufficient scheduling information that shows how the COR being requested
- 23 impacts the critical path of the project.
- 24 B. The City of Madison strongly encourages the GC to explore alternative methods and practices prior to submitting
- 25 a COR with a request for contract extension.
- 26

27 **1.5. OVERHEAD AND PROFIT MARKUP**

- 28 A. Pursuant to the City of Madison FACILITIES MANAGEMENT SPECIFICATIONS for Public Works Construction,
- 29 Section 104.7, Extra Work, the following maximum allowable markups shall be strictly enforced on all change
- 30 orders associated with the execution of this contract.
- 31 1. The total maximum overhead and profit shall not exceed fifteen percent (15%) of the total costs.
- 32 2. The total maximum overhead and profit shall be distributed as follows:
- 33 a. For work performed and materials provided solely by the General Contractor, fifteen percent
- 34 (15%) of the total costs.
- 35 b. For work performed and materials provided solely by Sub-contractors and supervised by the
- 36 General Contractor:
- 37 i. Supervision of the GC, five percent (5%) of the total Sub-contractor cost.
- 38 ii. Sub-contractors work and materials ten percent (10%) of the total Sub-contractor cost.
- 39

40 **1.6. PERFORMANCE REQUIREMENTS**

- 41 A. The GC shall become thoroughly familiar with this specification as it will identify procedures and expenses that
- 42 are or are not allowed under the Change Order and Change Order Request process.
- 43 B. The GC shall be responsible for all of the following:
- 44 1. Carefully reviewing the CB that is associated with the COR.
- 45 2. Collecting required supporting documentation from all contractors that quantify the need for a COR.
- 46 a. Labor hours and wage rates
- 47 b. Material costs
- 48 c. Equipment costs
- 49 C. The following shall apply to establishing prices for labor, materials, and equipment costs:
- 50 1. Where Work to be completed has previously been established by individual bid items in the contract bid
- 51 proposal the GC shall use the unit bid prices previously established.
- 52 2. Where Work to be completed was bid as a Lump Sum without individual bid items the GC shall provide a
- 53 breakdown of all labor, materials, equipment including unit rates and quantities required.
- 54 D. The completion date is determined by Owner. The schedule, however, is the responsibility of the GC. Time
- 55 extensions for extra Work will be considered when a schedule analysis of the critical path shows that the Change
- 56 Order Request places the Work beyond the completion date stated in the Contract.

1
2 **1.7. QUALITY ASSURANCE**

- 3 A. The GC shall be responsible for ensuring that all COR supporting documentation meets the following
4 requirements prior to completing the COR form on the Project Management Web Site:
5 1. Sufficiently indicates labor, material, and other expenses related to completing the intent of the CB.
6 2. No costs exceed the usual and customary amount for such items available in the geographical area of the
7 project, and no costs exceed those established under the contract.
8 B. The Project Architect /Project Engineer A/E PROJ MGR, Commissioning Agent (CxA), City Project Manager (CPM),
9 other members of the consulting staff, and city staff shall review all COR requests to ensure that the intent of the
10 CB will be met under the proposal of the COR or request additional information as necessary.
11

12 **PART 2 – PRODUCTS**

13
14 **2.1. CHANGE ORDER REQUEST FORM**

- 15 A. The COR form is located on the Project Management Web Site.
16

17 **PART 3 - EXECUTION**

18
19 **3.1. ESTABLISHING A CHANGE ORDER REQUEST**

- 20 A. Upon receipt of a Construction Bulletin (CB) where the GC believes a significant change in contract scope
21 warrants the submittal of a COR the GC shall do all of the following within ten (10) working days after receipt of
22 the CB:
23 1. Review the CB with all necessary trades and sub-contractors required by the change in scope.
24 a. Additions or deletions to the contract scope shall be as directed within the CB.
25 b. Additions or deletions of labor and materials shall be determined by the GC based on the
26 directives of the CB.
27 2. Assemble all required back-up documentation for additions and deletions of materials, labor and other
28 related contract costs as previously outlined in this specification.
29 3. Submit a COR request form on the Project Management Web Site.
30 B. Submitting a COR does not obligate the GC to complete the work associated with the COR nor does it obligate
31 the Owner to approve the COR as a change to the contract.
32

33 **3.2. SUBMIT A CHANGE ORDER REQUEST FORM**

- 34 A. This specification shall provide a subject overview only. In depth instructions shall be provided to the awarded
35 Contractor in a PDF Instructional Manual.
36 B. The GC shall select the appropriate link on the Project Management Web Site.
37 C. The software will open a new COR form and the GC shall provide all of the following information:
38 1. DO NOT perform any calculations on this worksheet, only provide the raw data as requested below. All
39 calculations, totals, and markups shall be computed as described within this specification.
40 2. Provide a summary description of the COR request, and justification for any requested time extension to
41 the contract, indicate the number of calendar days being requested for the extension and add any
42 attachments to the form as needed.
43 3. Provide all GC self-performance data including all of the following:
44 a. Materials description, quantities, and unit costs.
45 b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
46 c. Equipment descriptions, quantities, unit costs and rates.
47 4. Provide all Sub-contractor data including all of the following:
48 a. Materials description, quantities, and unit costs.
49 b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
50 c. Equipment descriptions, quantities, unit costs and rates.
51 5. Ensure all calculations performed by the form have been completed correctly. Contact the CPM directly
52 if you suspect an error before hitting the save button.
53 D. When all data has been entered submit the COR form. This will kick off the COR Review and Approval process.
54

55 **3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING**

- 56 A. The A/E PROJ MGR and CPM shall review all CORs submitted by the GC.

- 1 1. Additional consulting staff and city staff having knowledge of the components of the COR shall review
2 and advise the A/E PROJ MGR and CPM as to the accuracy of the items, quantities, and associated costs
3 of the COR as directed by the CB.
4 2. The CPM shall review the COR with the Owner.
5 B. If required the A/E PROJ MGR and CPM, shall in good faith, further negotiate the COR with the GC as necessary.
6 All amendments to any COR shall be documented within the Project Management Web Site software.
7 C. After final review of the COR the CPM and Owner may accept the COR.
8 D. The CPM shall prepare the COR in the form of an official Board of Public Works Change Order for final review and
9 approval as outlined in Section 01 26 63 Change Order (CO).
10 E. The GC shall not act upon any accepted COR until it has received final approval through the Public Works process
11 as an official CO to the Work unless instructed to do so by the CPM. Proceeding without the final approval of a
12 fully authorized Change Order is at the GC's own risk.
13

14 **3.4. EMERGENCY CHANGE ORDER REQUEST**

- 15 A. In the event Work is required due to an emergency as described in the Contract Documents, the GC must
16 request an equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the
17 commencement of such emergency.
18 B. The GC shall provide full documentation of all labor, materials and equipment used during the period of
19 emergency as part of the COR submittal.
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23 **END OF SECTION**
24

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**SECTION 01 26 63
CHANGE ORDER (CO)**

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13

PART 1 – GENERAL

1.1. SUMMARY

- 17 A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made
18 by the General Contractor (GC) without having prior approval of the City Project Manager (CPM).
19 B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in
20 the Work by written Change Order. Such changes may include additions and/or deletions.
21 C. The Change Order (CO) is a Board of Public Works (BPW) form that is reviewed and approved by a specific
22 process.
23 D. The CO form is typically made up of multiple Change Order Requests (CORs) and/or Bid Items as appropriate
24 depending on the type of project and how the contract was bid.
25 E. All CO documentation shall be processed through the Project Management Web Site (PMWS).
26

1.2. RELATED SPECIFICATION SECTIONS

- 27 A. Section 01 26 13 Request for Information (RFI)
28 B. Section 01 26 46 Construction Bulletin (CB)
29 C. Section 01 26 63 Change Order Request (COR)
30 D. Section 01 31 23 Project Management Web Site (PMWS)
31 E. Section 01 91 00 Commissioning
32
33

1.3. BOARD OF PUBLIC WORKS PROCEDURE

- 34 A. The Board of Public Works has a very explicit procedure for the review and approval of all change orders
35 associated with any Public Works Contract as follows:
36 1. The Supervisory Chain of the CPM shall review and approve any CO under \$20,000 provided it does not
37 include either of the following:
38 a. The CO does not request a time extension to the contract.
39 b. The CO does not cause the contract contingency sum to be exceeded.
40 2. The Board of Public Works shall review and approve any CO that requires any of the following:
41 a. Any CO over \$20,000.
42 b. Any CO requesting a time extension to the contract regardless of the monetary value of the CO.
43 c. Any CO that that causes the contract contingency sum to be exceeded.
44 B. The Board of Public Works generally meets every other week and only once in August and December. The GC is
45 cautioned that, under normal scheduling, a CO requiring a BPW review will take a minimum of two (2) weeks to
46 achieve final approval.
47 1. The City shall not be responsible for additional delays to the Work caused by the scheduling constraints
48 of the Board of Public Works.
49 C. ***SPECIAL NOTE:*** The GC is cautioned to never proceed unless told to do so by the CPM. Only in rare instances
50 may the CPM give a written notice to proceed on a COR without an approved CO. Proceeding without the
51 written notice of the CPM or an approved CO is at the GC’s own risk.
52
53

1 **PART 2 – PRODUCTS**
2

3 **2.1. CHANGE ORDER FORM**

- 4 A. The CO form is located on the Project Management Web Site. The CPM shall click the link in the left margin of
5 the project web site opening a new form. Project information is pre-loaded, the CPM only needs to enter
6 information and make attachments as needed to complete the form.
7

8 **PART 3 - EXECUTION**
9

10 **3.1. PREPARATION OF THE CHANGE ORDER**

- 11 A. The CPM shall prepare the required CO forms in the Project Management Web Site as follows:
12 1. Provide information for all contract information.
13 2. Provide a general description of the items described within the change order.
14 3. Provide detailed information for each Item on the CO form. At the option of the CPM, they may include
15 multiple Change Order Requests each as their own item.
16 4. Provide required pricing and accounting information as needed for the item.
17 5. Insert attachments of contractor/architect provided information that clarifies and quantifies the CO.
18 Attachments may include but not be limited to material lists, estimated labor, revised details or
19 specifications, and other documents that may be related to the requested change.
20 6. Save the final version of the completed CO.
21

22 **3.2. EXECUTION OF THE CHANGE ORDER**

- 23 A. Upon saving the CO as described in section 3.1 above, the software associated with the Project Management
24 Web Site shall notify the GC that the CO has been drafted and is ready for review. The GC shall do the following:
25 1. Open the CO form using the link provided in the email notification and review all items on the form.
26 2. The GC shall notify the CPM immediately of any errors or discrepancies on the form and shall not sign or
27 save it.
28 a. The CPM shall make any corrections as needed, re-save the form, and notify the GC.
29 3. If/when the GC concurs with the CO form as drafted the GC shall digitally sign the form and click SAVE.
30 B. After the GC digitally signs/saves the CO it shall be routed through the Project Management Web Site for
31 additional review and/or approvals. The CPM shall do the following:
32 1. Monitor the review process to ensure the software is working properly at each review step.
33 2. Ensure that proper BPW procedures are executed as needed by the CO approval process.
34 a. Schedule the CO on the next available BPW agenda if required.
35 i. Attend the BPW meeting to speak on the CO to board members and answer questions.
36 ii. The GC and/or the Project Architect /Project Engineer (A/E PROJ MGR) may be required to
37 attend the BPW meeting to address specific information as it relates to the Work and/or
38 materials associated with the CO.
39 3. Monitor final approval and distribution of the CO.
40 4. Notify the GC that the CO has been completed.
41 5. Ensure that the CO is posted to the next Public Works payment schedule.
42 6. Verify that the GC's next Progress Payment-Schedule of Values show the CO as part of the contract sum.
43 C. Upon final approval of the CO the GC may proceed with executing the Work associated with the CO.
44
45
46

47 **END OF SECTION**
48

SECTION 01 29 73
SCHEDULE OF VALUES

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13 3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL2
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15

PART 1 – GENERAL

1.1. SUMMARY

- 19 A. The Schedule of Values (SOV) is a Contractor provided statement that allocates portions of the total contract
20 sum to various portions of the contracted work and shall be the basis for reviewing the Contractors Progress
21 Payment Requests.
22 B.
23 C. The General Contractor shall be responsible for filling out and updating the SOV in the Project Management
24 website with each Progress Payment Request.
25

1.2. RELATED SPECIFICATIONS

- 26 A. Section 01 26 63 Change Order (CO)
27 B. Section 01 29 76 Progress Payment Procedures
28 C. Section 01 31 23 Project Management Web Site (PMWS)
29 D. Section 01 32 26 Construction Progress Reporting
30 E. Section 01 33 23 Submittals
31 F. Parts of this specification will reference articles within “The City of Madison FACILITIES MANAGEMENT
32 SPECIFICATIONS for Public Works Construction”.
33 1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONS web page:
34 <http://www.cityofmadison.com/business/pw/specs.cfm>
35 a. Click on the “Part” chapter identified in the specification text. For example, if the specification
36 says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2” click the link for
37 Part II, the Part II PDF will open.
38 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
39 to the referenced text.
40
41

1.3. RELATED DOCUMENTS

- 42 A. The following documents shall be used as the basis for initiating and maintaining the SOV worksheets throughout
43 the execution of this contract.
44 1. Drawing documents and specifications (including general provisions) as provided with the bid set
45 documents and any published addendums.
46 2. Documents associated with revisions or clarifications to number 1 above after awarding of the contract,
47 including but not limited to:
48 a. Construction Bulletins
49 b. Request for Information
50 c. Approved Change Orders
51 3. The latest daily/weekly Construction Progress Report
52 4. Other specifications as identified in Section 1.2 above
53
54

1.4. BASIS OF VALUES

- 55 A. The Contractor shall provide a breakdown of the Contract Sum in sufficient detail to assist the Architect and City
56 Project Manager in evaluating Progress Payment Requests. The breakdown detail may require a labor and
57 material breakdown for each division of work or trade or as directed by the CPM.
58

- 1 B. The total sum of all items shall equal the Contract Sum.
2

3 **PART 2 – PRODUCTS – THIS SECTION NOT USED**
4

5 **PART 3 - EXECUTION**
6

7 **3.1. APPLICATION FOR PAYMENT**

- 8 A. The Contractor shall use the Project Management website or Payment with each Progress Payment Request.
9 B. Completely fill out the Pay Application per the tutorial provided for the PMWS
10 1. Fill out to reflect the current status of the contract through the payment date being requested.
11 2. The City of Madison calculates retainage on Public Works Contracts as follows:
12 a. In general, across the duration of the contract, 2.5% of the total contract sum, including change
13 orders, is withheld for retainage as referenced from the City of Madison FACILITIES
14 MANAGEMENT SPECIFICATION 110.2:
15 i. Beginning with Progress Payment 1, 5% retainage will be withheld until such time that 50%
16 of the total contract sum has been paid out.
17 ii. No additional retainage will be withheld after 50% of the total contract sum has been paid,
18 unless additional change orders have been approved after the 50% milestone has been
19 reached. Per City of Madison FACILITIES MANAGEMENT SPECIFICATION 110.2, additional
20 retainage up to 10%, may be held in the event there are holds placed by Affirmative Action
21 or liquidated damages by BPW.
22 iii. Retainage for additional change orders after the 50% milestone will be withheld at the rate
23 of 2.5% of the total cost of the change order.
24 iv. Retainage is based on the change orders posted to the City's contract worksheet at the
25 time the progress payment is processed.
26 C. Only change orders that have been finalized and posted to the City of Madison's Application for Partial Payment
27 worksheet may be itemized into the SOV documents.
28 D. The Contractor shall sign and date the application.
29

30 **3.2. PROJECT MANAGEMENT WEBSITE SOV SPREADSHEET**

- 31 A. The Contractor shall use the PMWS spreadsheet provided by the City to itemize their SOV for this contract.
32 Provide additional sheets as necessary.
33 B. Provide information by any method that allocates portions of the total contract sum to various portions of the
34 contracted work. Possible methods include combinations of the following:
35 1. By division of work
36 2. By contractor, sub-contractor, sub sub-contractor
37 3. By specialty item or group
38 4. Other methods of breakdown as may be requested by the City Project Manager or City Construction
39 Manager at the pre-construction meeting.
40 C. Provide total cost of the item/description of work including proportionate shares of profit and overhead related
41 to the item.
42

43 **3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL**

- 44 A. The Contractor shall upload their initial SOV to the Project Management Web Site, no later than five (5) working
45 days after the Pre-construction Meeting.
46 1. The level of detail shall be as described in section 3.2 above.
47 B. The Project Architect /Project Engineer (A/E PROJ MGR) and the City Project Manager (CPM) shall review the
48 SOV as any other submittal and may require modifications to reflect additional detail as necessary.
49 C. The Contractor shall resubmit the SOV as necessary until such time as the A/E PROJ MGR and CPM have
50 sufficient detail for assessing and approving future Progress Payment Applications.
51 D. Progress Payment Application 1 will not be processed until such time as the Contractor has met this requirement
52 regardless of the amount of work completed per the application.
53

54 **3.4. SOV FOR PROGRESS PAYMENT REQUESTS**

- 55 A. The Contractor shall update the initial SOV with each Progress Payment Application as follows:
56 1. Initial items and values as part of Section 3.3 above will not be adjusted once the original Schedule of
57 Values submittal has been approved.

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- 2. Change orders shall be added as additional items and values at the bottom of the SOV as they become approved and posted to the City’s contract worksheet. The value for each change order shall be the value indicated on the SOV and shall stand alone. Values shall not be split out or combined with other existing items with similar work descriptions on the original SOV.
 - 3. Fill out columns to properly reflect the work completed and materials received since the last Progress Payment Application.
 - 4. Only materials delivered and stored on the project site may be reflected on SOV progress updates.
 - B. Provide an updated project schedule with each Progress Payment application.
 - C. See Specification 01 29 76 Progress Payment Procedures for additional information on submitting Progress Payment Applications.

END OF SECTION

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**SECTION 01 29 76
PROGRESS PAYMENT PROCEDURES**

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13 3.3. CITY PROJECT MANAGER PROCEDURE4
14

PART 1 – GENERAL

1.1. SUMMARY

- 18 A. The General Contractor (GC) shall review this and all related specifications prior to submitting progress payment
19 requests.
20 B. Progress payment requests (Partial Payment-PP) for this contract shall be applied for by the GC in the Project
21 Management Web Site (PMWS)
22 C. The City Project Manager (CPM) shall review and amend or approve the PP on the Project Management Web
23 Site.
24 D. After approval of the PP by the CPM, they shall forward the PP to the appropriate agencies for BPW contractual
25 review and payment processing.
26

1.2. RELATED SPECIFICATIONS

- 27
28 A. Section 01 26 63 Change Order (CO)
29 B. Section 01 29 73 Schedule of Values
30 C. Section 01 31 19 Progress Meetings
31 D. Section 01 31 23 Project Management Web Site (PMWS)
32 E. Section 01 32 16 Construction Progress Schedules
33 F. Section 01 32 26 Construction Progress Reporting
34 G. Section 01 33 23 Submittals
35 H. Section 01 45 16 Field Quality Control Procedures
36 I. Section 01 77 00 Closeout Procedures
37 J. Section 01 78 13 Completion and Correction List
38 K. Section 01 78 23 Operation and Maintenance Data
39 L. Section 01 78 36 Warranties
40 M. Section 01 78 39 As-Built Drawings
41 N. Section 01 78 43 Spare Parts and Extra Materials
42 O. Section 01 79 00 Demonstration and Training
43

1.3. RELATED DOCUMENTS

- 44
45 A. The following documents shall be used when evaluating PP requests.
46 1. Daily and weekly construction progress reports filed since the last payment request.
47 2. Contractors Schedule of Values as updated from the last payment request. See Specification 01 29 73.
48 3. Any document that may be required to be submitted for review and approval, as noted by the
49 specifications listed in Section 1.2 above, or the Progress Payment Milestone Schedule in Section 1.4
50 below, to achieve a required bench mark of contract progression or contract requirement.
51

1.4. PROGRESS PAYMENT MILESTONES

- 52
53 A. City Engineering-Facility Management has developed the Project Payment Milestone Schedule (Section 1.4
54 below) to assist the GC in providing required construction specific documentation and general contractual
55 documentation in a timely manner.
56 B. The Progress Payment Milestone Schedule is not an all inclusive list. Multiple agencies review progress payment
57 requests and contract closeout requests. Missing, incomplete, or incorrect documentation for any agency may

- 1 be a cause for not processing progress payments. It shall be the sole responsibility of the Contractor for
 2 providing documentation as required or requested to the appropriate agencies.
 3 C. The milestone schedule is based on the contract total sum and shall be valid for most contracts. Milestone
 4 submittals will be required with whatever progress payment hits the percentage of contract total indicated in
 5 the schedule.
 6 D. The CPM shall review the milestone schedule with each progress payment request and at their option may elect
 7 to hold processing the progress payment until such time as the contractor has met the requirements for
 8 providing construction specific documentation.
 9 E. It shall be the General Contractors responsibility to comply with all BPW Contract Administration requirements
 10 and related deadlines as outlined in the Award Letter, Award Checklist, and Start Work Letter.
 11

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
BPW Contract Administration Documentation <ul style="list-style-type: none"> • Workforce profiles • Best Value Contracting Documentation • Sub-contractors prequalification approval & Affirmative Action plans • Submittals Schedule • Other as may be required 	PP-1, or start work as applicable	<ul style="list-style-type: none"> • For GC and Sub-contractors before PP-1 regardless of scheduling • Sub-contractors (if applicable), due 10 days before they may start work • Sub-contractors (if applicable), due 10 days before they may start work • Specification 01 32 19
Required Construction Submittals/Administrative Documents <ul style="list-style-type: none"> • Contractors Project Directory • Schedule of Values • Waste Management Plan • Closeout Requirement Checklist • Warranty Checklist • Time Lapse Construction Camera (camera installed and operational) 	PP-1	References <ul style="list-style-type: none"> • Specification 01 31 23 • Specification 01 29 73 • Specification 01 74 19 • Specification 01 77 00 • Specification 01 78 36 • Specification 01 32 33
Construction Progress Milestones <ul style="list-style-type: none"> • Early submittals, per submittal schedule • Detailed Contract Schedules 	PP-1	See specifications for specific requirements <ul style="list-style-type: none"> • Specification 01 32 19, Examples: concrete mix, structural steel, products with long lead times • See Specification 01 32 16
General Construction Progress Requirements are all up to date <ul style="list-style-type: none"> • Progress Schedules • Submittals/Re-submittals (ongoing) • Schedule of Values • Progress Reporting • LEED Documentation • Waste Management documentation • QMOs are being addressed and closed • Progress Cleaning • As-Built Drawings 	Each future PP	Verified with each Progress Payment Request <ul style="list-style-type: none"> • Specification 01 32 16 • Specification 01 33 23 • Specification 01 29 73 • Specification 01 32 26 • All specifications with LEED documentation requirements • Specification 01 74 19 • Specification 01 45 16 • Specification 01 74 13 • Specification 01 78 39
* All of the above are being updated on the Project Management Web Site as required		

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
BPW Contract Administration Documentation <ul style="list-style-type: none"> Weekly payroll reports 	25% CT or PP 2	See 1.4.E above. <i>This progress payment will be withheld by BPW for any missing contractual documentation.</i>
<ul style="list-style-type: none"> Best Value Contracting Reports SBE Reports 		
Construction Progress Milestones <ul style="list-style-type: none"> Construction/Contract Closeout Meeting #1 Submittals/Re-submittals complete 	50% CT	<ul style="list-style-type: none"> Specification 01 31 19 Specification 01 33 23
Operation and Maintenance (O & M) drafts	60% CT	<ul style="list-style-type: none"> Specification 01 78 23
Construction/Contract Closeout Meeting #2 <ul style="list-style-type: none"> Construction closeout checklist 	70% CT	<ul style="list-style-type: none"> Specification 01 31 19 Specification 01 77 00
BPW Contract Administration Documentation <ul style="list-style-type: none"> Request Finalization Review from BPW 	80% CT	This is a recommendation to the GC and is not a requirement of this PP. <ul style="list-style-type: none"> Specification 01 77 00
Construction Progress Milestones <ul style="list-style-type: none"> Operation and Maintenance (O & M) finals, accepted All major QMO issues resolved As-Built Drawings, Division Trades ready for GC review 	80% CT	<ul style="list-style-type: none"> Specification 01 78 23 Specification 01 45 16; Items that could prevent occupancy Specification 01 78 39
All of the following shall be completed for this PP: <ul style="list-style-type: none"> Regulatory Inspections completed All QMO reports closed Demonstration and Training completed Attic Stock completed Final Cleaning 	90% CT	Contractor to determine the proper order of completion: <ul style="list-style-type: none"> Governing ordinances and statutes Specification 01 45 16 Specification 01 79 00 Specification 01 78 43 Specification 01 74 13
Construction Closeout Procedures: <ul style="list-style-type: none"> Letter of Substantial Compliance sent to BI and DHS as needed Certificate of Occupancy issued As-Built Drawings, finals, accepted City Letter of Substantial Completion Warranty letters dated and issued 	100% CT	<ul style="list-style-type: none"> Specification 01 77 00 Generated/Signed by the Architect Building Inspection Specification 01 78 39 Signed by the City Engineer Specification 01 78 36
* Completion of this begins the one year warranty.		
BPW Contract Administration Documentation Contract Closeout Procedures <ul style="list-style-type: none"> Construction Closeout has been completed Contractor requests final payment of retainage upon receiving City Letter of Substantial Completion 	Final	<ul style="list-style-type: none"> Specification 01 77 00

Progress Payment (PP) Milestone Schedule		
Milestone Description	Due Before	Remarks
<ul style="list-style-type: none"> All BPW contractual requirements are verified 		<ul style="list-style-type: none"> Contractor must provide any missing BPW Contractual Documentation
* Completion of this closes the contract but not the warranty period/bond.		
NOTE: CT = Contract Total less held retainage		

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1.5. PROGRESS PAYMENT SUBMITTAL

- A. Each progress payment submittal shall be completed in the Project Management Website. See guide on the Project Management Website for the procedure.
- B. Submit all required construction progress documentation to the appropriate Project Management Web Site component as described in guides.
- C. In general the following shall apply to all PP requests:
 - 1. Materials or products:
 - a. On order, being shipped, etc. may not be invoiced.
 - b. Received and stored on the project site may be invoiced.
 - c. Being manufactured off site at any location may not be invoiced (example: cabinetry, ductwork, etc.)
 - d. Completed products stored off site locally waiting for delivery to the project site may be invoiced with prior approval by the CPM. All of the following conditions must be met to be allowed:
 - i. Items must be visually inspected by CPM to verify product is complete.
 - ii. Item must be stored inside a compatible structure and the structure and contents must be insured.
 - iii. Contractor is responsible for condition until installation is completed.
 - 2. All labor and equipment, including rental time for the current progress period may be invoiced.
 - 3. Only completed installations may be invoiced to 100% based on the Schedule of Values.
- D. DO NOT submit BPW Contract Administration Documentation for review with Progress Payment Requests, submit them directly to the correct agency and in the correct format as instructed from information in your BPW Contract Award Packet instructions.

PART 2 - PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR PROCEDURE

- A. The GC shall use the Project Management Website for each PP request.
 - 1. The GC shall subtotal the work completed to date for all of the original Schedule of Value items.
 - 2. Ensure that any newly posted change orders have been entered.
 - 3. The GC shall submit the PP request in the Project Management Website. The username and date will be automatically recorded.
 - 4. The GC shall provide the dates from and to for the PP being requested.
 - 5. The GC shall provide the list of all contractors/sub-contractors that were actively working during the dates indicated above. The guide details the appropriate location for this list.
 - a. All contractors/sub-contractors named must be in compliance with all City requirements (Pre-qualified, Affirmative Action Plan on file, etc). The PP will be held and not processed by the City of Madison until all contractors/sub-contractors are in compliance.
 - b. Do not list the names of suppliers or manufacturers, doing so will slow down processing and require a re-submittal of the paperwork.
 - 6. The GC shall attach a copy of the current Project Schedule.

3.3. CITY PROJECT MANAGER PROCEDURE

- A. The CPM shall review all documents submitted by the GC to ensure the schedule of values accurately reflects the work completed to date.
- B. The CPM may elect to hold processing of any progress payment pending submittal of required progress payment milestones.

- 1 C. When verified, the CPM shall send the PP and required documentation to the appropriate City agencies for
- 2 further processing of the payment request.
- 3 D. The PP processing will be completed and available for view within the PMWS.
- 4
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**SECTION 01 31 13
PROJECT COORDINATION**

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PART 1 – GENERAL

1.1. SUMMARY

- 16 A. Project Coordination covers many areas within the execution of the Contract Documents and the requirements
17 of proper coordination are the applicable to all contractors executing the Work of this contract.
18 B. This specification provides general information regarding project coordination for the General Contractor and all
19 Sub-contractors. All contractors shall be familiar with project coordination requirements and responsibilities
20 that may be defined in other specification within these Contract Documents.
21 C. The General Contractor shall at all times be responsible for the project, project site, and execution of the
22 Contract Documents.
23

1.2. RELATED SPECIFICATIONS

- 24 A. Section 01 29 76 Progress Payment Procedures
25 B. Section 01 31 19 Progress Meetings
26 C. Section 01 31 23 Project Management Web Site
27 D. Section 01 32 16 Construction Progress Schedules
28 E. Section 01 32 19 Submittals Schedule
29 F. Section 01 33 23 Submittals
30 G. Section 01 43 39 Mockups
31 H. Section 01 45 16 Field Quality Control Procedures
32 I. Section 01 60 00 Product Requirements
33 J. Section 01 77 00 Closeout Procedures, including all specifications referenced therein
34 K. Section 01 91 00 Commissioning
35
36

1.3. GENERAL REQUIREMENTS

- 38 A. The following general requirements shall applicable to all contractors:
39 1. Cooperate with the Owner, all authorized Owner Representatives, Project Architect and all consultants of
40 the Owner.
41 2. Materials, products, and equipment shall be new, as specified and to industry standards except where
42 otherwise noted.
43 3. Labor and workmanship shall be of a high quality and to industry standards.
44 B. Existing conditions:
45 1. Verify all existing conditions noted in the contract documents with actual filed locations. Verify
46 dimensions, sizes and locations, of structural, equipment, mechanical and utility components.
47 2. Report any inconsistencies, errors, omissions, or code violations in writing to the General Contractor (GC)
48 immediately.
49 3. Annotate any inconsistencies, errors, omissions on the GC As-Built record drawings immediately for
50 future reference.
51 C. Contract Documents:
52 1. The Contract Documents are intended to include everything necessary to perform the work. Every item
53 required may not be specifically mentioned, shown, or detailed.
54 a. Except where specifically stated all systems and equipment shall be complete, installed, and fully
55 operable.
56 b. If a conflict exists within the contract documents the contractor shall furnish the item, system, or
57 workmanship of the highest quality, largest, largest quantity, or most closely fits the intent of the
58 contract documents.

- 1 c. Manufacturers recommended installation details shall be verified and used prior to installation of
- 2 products and equipment so as to not void warranties.
- 3 D. Errors and Omissions
- 4 1. No Contractor shall take any advantage of any apparent error or omission in the construction documents.
- 5 2. The City of Madison shall be permitted to make such corrections and interpretations as may be deemed
- 6 necessary for the fulfillment of the intent of the construction documents.
- 7 E. Owners Representatives
- 8 1. All contractors shall be familiar with various Owner Representatives having Quality Management
- 9 responsibilities for the duration of this project including but not limited to the following:
- 10 a. Project Architect, responsible for all decisions affecting the code compliance and design intent of
- 11 the construction documents.
- 12 b. Consulting Architects and Engineers, responsible for providing consulting services to the Project
- 13 Architect, Owner, and City Project Manager, also responsible for Quality Management of the
- 14 construction documents.
- 15 c. Owner, the designated representative of the City Agency that will occupy the project upon
- 16 completion.
- 17 d. City Project Manager, responsible for all day to day decisions regarding the execution and
- 18 performance of this Public Works Contract.
- 19 e. Consulting City Staff, responsible for providing consulting services to the Project Architect, Owner,
- 20 and City Project Manager, also responsible for Quality Management of the construction
- 21 documents.
- 22 f. Commissioning Agent (CxA), responsible for ensuring that the project is meeting the Owner's
- 23 Project Requirements and related quality assurance procedures.
- 24 2. Owner Representatives shall be attending progress meetings, pre-installation meetings, performing or
- 25 being present for final testing and acceptance and quality management reporting during the execution of
- 26 the contract documents as outlined in other specifications.
- 27

28 **1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS**

- 29 A. Assume the responsibility for all Work specified in the Contract Documents except where specifically identified
- 30 to be performed by the Owner or other contractor separately hired by the Owner.
- 31 1. Coordinate all work by Owner, equipment provided Owner, or contractor hired by the Owner into the
- 32 project schedule.
- 33 B. Provide all construction management responsibilities as specified in other Division 1 specifications including but
- 34 not limited to:
- 35 1. Scheduling of work
- 36 2. Coordination of work between other Trades and Sub-contractors
- 37 3. Construction administration and management
- 38 4. Site layout, cleanliness, and protection of completed work/stored materials
- 39 5. Waste Management
- 40 6. Quality Assurance and Quality Control
- 41 C. Use Diggers Hotline and private utility locating companies to accurately locate all public and private utilities on
- 42 the property as needed. The GC is responsible for any repair or replacement to any public or private utility
- 43 damaged during the execution of the Work
- 44 D. Report any inconsistencies, errors, omissions, or code violations in writing to the Project Architect immediately.
- 45 Failure to report inconsistencies prior to beginning work shall indicate that the GC accepted all existing
- 46 conditions.
- 47 E. The GC shall be responsible for assigning work and related responsibilities where the Contract Documents may
- 48 not clearly state who is responsible for providing the work, material, or product.
- 49 F. Provide construction management oversight of all items described in Section 1.5 below.
- 50 G. Coordinate and assist CxA as outlined within 01 91 00 and as directed by Owner.
- 51

52 **1.5. SUB-CONTRACTOR PERFORMANCE REQUIREMENTS**

- 53 A. Be familiar with all of the contract documents as they pertain to your Work, adjacent work and the overall
- 54 progress of the project.
- 55 1. All Sub-contractors shall be familiar with all Division 1 specifications as they may apply to progress,
- 56 progress payments, quality control construction management, and closeout of the contract.
- 57 B. Coordinate your Work with all adjacent work and existing conditions.

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1. Perform your work in proper sequence according to the GC's project schedule and in relation to the work of other trades.
 2. Notify other sub-contractors and trades whose work may be connected to, combined with, or influenced by your work and allow them reasonable time and access to complete their work.
 3. Join your work to the work of others in accordance with the intent of the Contract Documents.
 4. Order materials and schedule deliveries to facilitate the general progress of the Work.
- C. Cooperate with all other trades to facilitate the general progress of the work. This shall include providing every reasonable opportunity for the installation of work by others and the storage of their materials and equipment.
1. In no case shall any contractor exclude from the premises or work any Sub-contractor or their employees.
 2. In no case shall any contractor interfere with the execution or installation of Work by any other Sub-contractor or their employees.
- D. Arrange your work, equipment, and materials and dispose of your construction waste so as to not interfere with the work or storage of materials of others.
- E. Coordinate all work as indicated during pre-installation meetings with Owner Representatives, the GC and other trades. Any work improperly coordinated shall be relocated as designated by the Owner Representative at no additional cost to the City.
- F. Coordinate and assist CxA as outlined within 01 91 00 and as directed by Owner.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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**SECTION 01 31 19
PROJECT MEETINGS**

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to identify various project related meetings and the responsible parties for
22 scheduling, agendas, minutes, and required attendance.
23 B. This specification is not intended to be inclusive of all meeting types or a complete list of required meetings.
24 C. This specification is not intended to cover planning and execution meetings between the General Contractor
25 (GC) and their sub-contractors.

1.2. RELATED SPECIFICATIONS

- 28 A. 01 31 23 Project Management Web Site
29 B. 01 32 16 Construction Progress Schedules
30 C. 01 43 39 Mockups
31 D. 01 91 00 Commissioning

1.3. PROJECT MEETING TYPES

- 34 A. The following project meeting types may be used but not limited to the following
35 1. Preconstruction Meeting
36 2. Project Management Web Site – Tutorial Meeting
37 3. Construction Progress Meetings
38 4. Pre-installation Meetings (including mock-up review meetings)
39 5. Weekly Trade Meetings
40 6. Special Meetings
41 7. Commissioning Meetings

1.4. GENERAL REQUIREMENTS

- 44 A. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and
45 authorized to act on behalf of the entity each represents.
46

PART 2 – PRODUCTS – NOT USED IN THIS SECTION

PART 3 - EXECUTION

3.1. PRECONSTRUCTION MEETING

- 52 A. After execution of the Contract the City Project Manager (CPM) shall schedule and conduct the Preconstruction
53 Meeting at the Owner’s facilities. The CPM shall coordinate the meeting agenda with the Project Architect and
54 the GC Project Manager.
55 B. The CPM shall be responsible for the final agenda.
56 C. The CPM and Project Architect shall take notes on the meeting and post completed meeting minutes.
57 D. Attendance shall be required by all of the following:
58 1. Owner Representative(s)

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2. Architect and applicable sub consultant(s)
 3. General Contractor and applicable subcontractors and suppliers
 4. City Quality Management Staff
 5. Commissioning Agent
 6. Others, as may be invited for particular agenda items.
- E. Topics of the Preconstruction Meeting shall include but not be limited to the following:
1. Staff and contractor introductions
 2. Completion Date
 3. BPW Administrative requirements and due outs
 - a. Small Business Enterprise (SBE) (if applicable)
 - b. Certified payroll forms
 - c. Workforce profiles
 - d. Best Value Contracting (BVC)
 4. General Facility Management Division 1 Specifications, including:
 - a. Section 01 29 76 Progress Payment Procedures
 - b. Section 01 31 23 Project Management Web Site (overview)
 - c. Section 01 45 16 Field Quality Control Procedures
 - d. Section 01 77 00 Closeout Procedures
 - e. Section 01 91 00 Commissioning
 5. Project Meeting scheduling
 - a. Section 01 31 19 Project Meetings
 6. Construction Schedule
 7. Commissioning Process

3.2. PROJECT MANAGEMENT WEB SITE – TUTORIAL MEETING

- A. The CPM shall schedule and conduct a virtual tutorial presentation of the PMWS prior to the beginning of construction.
- B. The CPM shall be responsible for the final agenda, there will be no minutes.
- C. The required attendance list in 3.1.D. above shall apply except for City Staff in items 1 and 4 who are already familiar with the PMWS system.

3.3. CONSTRUCTION PROGRESS MEETINGS

- A. In general, all of the following shall apply:
 1. Representatives of Contractors, Subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
 2. The attendance shall be from the required attendance list in 3.1.D. above.
- B. The General Contractor Project Manager (GCPM) shall:
 1. Schedule and conduct all construction progress meetings biweekly or more frequently as required.
 2. Prepare agenda for meetings including, but not limited to the following:
 - a. Safety
 - b. Current Schedule, including review of the critical path and 6-week look ahead schedule
 - c. Status of project related documentation (Submittals, RFIs, CBs, etc.)
 - d. Quality Observation Log and status of correction of deficient items
 - e. Project questions and issues from meeting attendees
 - f. BPW Administration Check
 - g. Other as needed
 - h. Status of CORs and COs to be reviewed outside the standard progress meeting time.
 3. Make physical arrangements for meetings.
 4. GCPM to post meeting agendas to the appropriate libraries on the Project Management Web Site (PMWS) no less than two (2) working days prior to the scheduled meeting. Notify all required attendees, applicable parties to the contract, and others affected of the posted meeting agenda.
 5. Preside at meetings.
 6. Route a meeting attendance roster for attendees to sign-in on.
 7. GCPM to record the minutes of the meeting; include significant proceedings and decisions. Post meeting minutes to the PMWS no more than two (2) working days after the completed meeting. Meeting minutes shall include a scanned copy of the attendance sign-in sheet. Notify all required meeting attendees, applicable parties to the contract, and others affected by decisions made at the meetings.
 8. The above requirements do not apply to GC/sub-contractor meetings.

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3.4. PRE-INSTALLATION MEETINGS

- A. The GCPM shall schedule and conduct all pre-installation meetings, including mockup reviews, before each construction activity that requires coordination with other trades.
- B. The GCPM shall be responsible for the final agenda and meeting minutes.
- C. The GCPM will work with all concerned parties to resolve issues as needed and submit RFI's if necessary.
- D. Required attendance shall be from the list in 3.1.D. above and shall be personnel having a stake in the outcome of the installation or knowledge of the system being installed.
- E. In the event the Contractor installs equipment or materials without a pre-installation meeting the Contractor shall be solely responsible for removing, replacing, repositioning materials and equipment as instructed by the Project Architect or City Project Manager at no additional cost to the City.

3.6 PRE-CONTRACT CLOSEOUT MEETINGS

- A. Two (2) Pre-contract Closeout Meetings shall be held to review the closeout procedures, requirements, and contract deliverables.
 - 1. Pre-contract Closeout Meeting #1 shall be scheduled prior to the 50% Progress Payment Request is being requested. This meeting shall discuss items such as closing out QMO reports, providing O&M drafts and finals, payroll and Affirmative Action documentation, and other contract deliverables.
 - 2. Pre-contract Closeout Meeting #2 shall be scheduled prior to the 80% Progress Payment Request is being requested. This meeting shall discuss, but not be limited to, the status of scheduling final regulatory inspections, cleaning up outstanding QMO's, demonstration and training, attic stock; and finalization review of payroll and other related documents.
- B. The GCPM shall schedule, coordinate, and make physical arrangements for both meetings.
- C. All of the following shall be required to attend both meetings:
 - 1. The GCPM and the GC Field superintendent
 - 2. All Subcontractor Project Managers regardless of the current status of their work.
 - a. The GCPM may excuse a Subcontractor PM if they are confident that all contractual requirements for closeout by the subcontractor have been completed and/or delivered to the GCPM. The list of attendees shall be reviewed and agreed upon with CPM ahead of the meeting.
 - b. At the option of these project managers the field supervisors may also attend.
 - 3. The Project Architect and at least one design consultant from each discipline represented by the plans and specifications to address open QMOs, final tests, reports, etc.
 - 4. The Owner
 - 5. The CPM
 - 6. Quality Management staff as needed to address open QMOs, final tests, reports, etc.
 - 7. The Commissioning Agent
- D. The CPM shall publish an agenda and chair the meeting.

3.7 OTHER SPECIAL MEETINGS

- A. The Contractor shall schedule special meetings per the requirements of the LEED Specification, the Project Quality Management Plan, the Commissioning Plan and as indicated by other specifications.
- B. Special meetings include but are not limited to the following:
 - 1. Waste Management Conference
 - 2. Equipment start up meetings
 - 3. Testing and balancing meetings
 - 4. Commissioning meetings
 - 5. Other meetings as necessitated by the contract documents

END OF SECTION

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**SECTION 01 31 23
 PROJECT MANAGEMENT WEB SITE**

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 10 3.1. POST BID-OPENING2
 11 3.2. POST PRE-CONSTRUCTION MEETING.....2

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

- A. The City of Madison (CoM) has established a cloud-based Project Management Tool (PMT) using an Autodesk product called Autodesk Construction Cloud (ACC).
- B. The software is used throughout the design, construction and warranty process of major remodels and new construction projects.
- C. Initially deployed in mid-2023, the PMT software will be deployed on all projects. The PMT software is cloud-based software and therefore will receive regular updates and enhancements.

1.2. AUTODESK CONSTRUCTION CLOUD PROCEDURE OVERVIEW

- A. The CoM PMT is 3 main modules. The [Autodesk Docs \(https://help.autodesk.com/view/DOCS/ENU/\)](https://help.autodesk.com/view/DOCS/ENU/) module is a document management file system that is the foundation of ACC. The [Build https://help.autodesk.com/view/BUILD/ENU/](https://help.autodesk.com/view/BUILD/ENU/) module has many sections that assist in performing day to day functions of design/construction management while reducing the use of different software platforms, surface mail, email and email attachments. Finally, the [Cost management \(https://help.autodesk.com/view/BUILD/ENU/?guid=Cost_Overview\)](https://help.autodesk.com/view/BUILD/ENU/?guid=Cost_Overview) module is used to manage project finances.
 - 1. Files within Autodesk Docs can store a wide variety [file formats \(https://help.autodesk.com/view/DOCS/ENU/?guid=Supported_Files_Docs\)](https://help.autodesk.com/view/DOCS/ENU/?guid=Supported_Files_Docs) including but not limited to Word, Excel, PDF, photographs (all popular formats), etc.
 - 2. The Issues section within the Build module is used for Punch Lists, Quality Control and Warranty issues.
 - 3. File Folder and module section access are controlled by Permission Groups and Permission Level
- B. A tutorial document on the web based PMT will be provided to the General Contractor (GC) who is awarded the contract. Additional training will be provided as needed for the GC and Sub-Contractors (SC) by the CoM.
- C. The PMT has predefined work flows that channel automated alerts as documents are uploaded, reviewed, and completed. These workflows are designed for inbound information from the contractor as well as outbound information from the Architectural/Engineer consultant and the Owner.
- D. The GC will be required to receive email notifications, access the internet to review related documentation and be able to upload/download documentation to the various project modules or folders.
- E. The SC's will be required (at a minimum) to receive email notifications and access the internet to review related documentation. Prior to setting up the final PMT the GC and CPM shall meet to review all ACC workflows, the GC will determine to what level over the minimum requirements the SC's will be involved.
- F. At final project closeout with the GC, the CoM will provide the Project Architect/Project Engineer (A/E PROJ MGR) and the GC, an exported version of the complete project in ACC.

1.3. RELATED SPECIFICATIONS

- A. The following specification sections are directly related to the CoM PMT system.
 - 1. 01 25 13 Product Substitution Procedures
 - 2. 01 26 13 Request for Information (RFI)
 - 3. 01 26 46 Construction Bulletins (CB)
 - 4. 01 26 57 Change Order Request (COR)
 - 5. 01 26 63 Change Order (CO)
 - 6. 01 29 76 Progress Payment Procedures
 - 7. 01 31 19 Project Meetings
 - 8. 01 32 16 Construction Progress Schedules
 - 9. 01 32 26 Construction Progress Reporting

- 1 10. 01 32 33 Photographic Documentation
2 11. 01 33 23 Submittals
3 12. 01 45 16 Field Quality Control Procedures (Owner)
4

5 **PART 2 - PRODUCTS**

6
7 **2.1. AUTODESK CONSTRUCTION CLOUD SYSTEM RELATED PRODUCTS**

- 8 A. Autodesk Construction Cloud is an Autodesk based software that requires no additional software installation,
9 hardware or other special requirements/applications for the users. There are no costs associated with the use of
10 this system.
11 B. Please consult Autodesk's web site for the [latest system requirements](https://help.autodesk.com/view/BUILD/ENU/?guid=System_Requirements_ACC)
12 (https://help.autodesk.com/view/BUILD/ENU/?guid=System_Requirements_ACC)
13

14 **PART 3 - EXECUTION**

15
16 **3.1. POST BID-OPENING**

- 17 A. After bids have been opened, a successful bidder has been determined, and bid acceptance procedures have
18 been initiated the City Project Manager (CPM) will contact the GC to provide the following information.
19 1. [Autodesk Construction Cloud Help \(https://help.autodesk.com/view/BUILD/ENU/\)](https://help.autodesk.com/view/BUILD/ENU/) and [Learning Center](https://learnacc.autodesk.com/)
20 (<https://learnacc.autodesk.com/>) are kept up to date with latest ACC features.
21 2. For more customized workflows, Project Management Software Tutorials have been developed. These
22 tutorials are in a PDF printable format with screen shots and associated instructions on how to access and
23 use the PMT.
24 3. A blank Project Directory in an Excel spread sheet format. The contractor shall provide the following
25 information for GC and SC staffs as indicated on the spreadsheet. This will generally be the Project
26 Manager for the GC as well as the Sub-contractors and the GC Site Supervisor.
27 a. Last Name, First Name
28 b. Company Name
29 c. Email address (valid, work related)
30 4. Phone Contact number and professional name must be entered by each user themselves via
31 <https://profile.autodesk.com/>
32 5. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
33 6. The GC may provide project foreperson information for work being self-performed if he/she so desires.
34

35 **3.2. POST PRE-CONSTRUCTION MEETING**

- 36 A. The GCPM will return the completed Project Directory spread sheet to the CPM no later than the Pre-
37 construction meeting.
38 B. The City Project Admin is responsible for uploading all project directory data into ACC, adding users to project
39 and licenses to users for all non-city staff (GC/SC staffs).
40 C. All GC/SC staff will be notified through an automated email from Autodesk directing them to create an Autodesk
41 account if they do not already have one. It is the responsibility of each GC/SC to follow the instructions to setup
42 their own account
43 D. Once the GCPM has received his/her project invitation, uploading of contract related documents can begin. This
44 would include but not be limited to project schedules, submittals, RFI's, and other documents as needed.
45 E. All workflows, review of documentation, and general archiving of construction related documentation will be
46 conducted on the PMWS. These documents will generally not be emailed.
47 F. The following documents related to the execution of the contract will not be part of the PMT:
48 1. All documentation related to executing the contract, such as:
49 a. Sub Contractors list
50 b. Affirmative Action documentation
51 c. Bonding documentation
52 d. Documentation associated with payroll verification
53 e. Final documentation associated with closing out the contract
54 2. Any documentation required/generated by ordinance, code or statute, such as;
55 a. Erosion Control inspections
56 b. Building Inspection Department inspections
57
58

END OF SECTION

**SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES**

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10 3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)1
11 3.3. PROJECT MANAGEMENT WEB SITE (PMWS).....2
12

PART 1 – GENERAL

1.1. SCOPE

- 16 A. This specification is to identify various project related schedules associated with indicating construction progress
17 and outlook. The following schedules are the responsibility of the General Contractor (GC).
18 1. Overall Project Schedule
19 2. 6 Week Look-out Schedule
20 B. This specification is not intended to include internal schedules generated by the contractors during their
21 planning and execution of the contract.
22

1.2. RELATED SPECIFICATIONS

- 23 A. Section 01 29 76 Progress Payment Procedures
24 B. Section 01 31 23 Project Management Web Site
25 C. Section 01 31 19 Progress Meetings
26 D. Section 01 74 13 Progress Cleaning
27 E. Section 01 77 00 Closeout Procedures
28 F. Section 01 78 23 Operation and Maintenance Data
29 G. Section 01 78 36 Warranties
30 H. Section 01 78 39 As-Built Drawings
31 I. Section 01 78 43 Spare Parts and Extra Materials
32 J. Section 01 79 00 Demonstration and Training
33 K. Section 01 91 00 Commissioning
34 L. Other specification within the construction documents that may indicate the need for scheduling any event with
35 Owner, Project Architect, Owner Representatives, including any owner provided equipment.
36
37

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL PROJECT SCHEDULE (OPS)

- 43 A. The GC shall prepare an OPS that covers the duration of the contract from the pre-construction meeting through
44 the end of construction to final contract closeout.
45 1. The GC shall review Specification 01 77 00 Closeout Procedures to become familiar with definitions,
46 differences, and requirements for closing out the construction and contract including the association with
47 progress payments.
48 B. The GC shall provide copies and lead a discussion on the OPS during the pre-construction meeting.
49 C. The OPS shall indicate start and end dates of each task associated with the project.
50 D. The OPS shall clearly indicate the critical path of the project.
51 E. The GC shall update the OPS as often as necessary during the duration of the project. Updates will be briefed as
52 needed during bi-weekly progress meetings.
53

3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)

- 54 A. The GC shall prepare the initial LOS to include detail of daily tasks for the first six (6) weeks of construction in
55 depth for the Pre-construction meeting. The LOS shall be compatible and complimentary to the OPS.
56 B. The GC shall provide copies and lead a discussion on the LOS during the pre-construction meeting.
57

- 1 C. The LOS shall indicate start and end dates of each major task, associated related sub-tasks, and required parallel
- 2 or pre-requisite tasks required to complete the major task on time.
- 3 D. The LOS shall also include identifying and scheduling such events as:
- 4 1. Pre-installation meetings and mock-up review meetings.
- 5 2. Quality management reviews of installations before they are covered.
- 6 3. Owner provided equipment as designated by the contract documents.
- 7 4. Work by others as designated by the contract documents.
- 8 5. Critical submittal dates.
- 9 E. The GC shall update the LOS prior to each bi-weekly progress meeting to indicate the next 6 weeks of scheduled
- 10 work. Updates will be briefed during each bi-weekly progress meeting.
- 11

12 **3.3. PROJECT MANAGEMENT WEB SITE (PMWS)**

- 13 A. The GC shall upload all project schedules and updates to the PMWS in an original PDF version of the scheduling
- 14 document. Scans will not be permitted.
- 15

16
17 **END OF SECTION**
18

**SECTION 01 32 19
SUBMITTALS SCHEDULE**

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7 1.3. RELATED DOCUMENTS1
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PART 1 – GENERAL

1.1. SUMMARY

- 20 A. The General Contractor shall submit a complete and comprehensive list of all submittals anticipated during the
21 execution of this contract.
22 B. The GC shall include the Administrative submittals identified in item 1.5 below and shall be required to up load
23 them to the Project Management Web Site.
24 C. The initial Submittals Schedule shall be based on the original contract documents used at the time of bidding and
25 any posted addenda through awarding of the contract.
26 D. The Submittal Schedule may be appended during the execution of the contract based on amendments to the
27 contract in the form of Change Orders, Construction Bulletins, and other related documents that add, or change
28 the scope of the work.
29

1.2. RELATED SPECIFICATIONS

- 30 A. Section 01 29 76 Progress Payment Procedures
31 B. Section 01 31 23 Project Management Web Site (PMWS)
32 C. Section 01 33 23 Submittals
33 D. Section 01 91 00 Commissioning
34
35

1.3. RELATED DOCUMENTS

- 36 A. The following documents shall be used as the basis for initiating the original Submittals Schedule.
37 1. Drawing documents and specifications (including general provisions) as provided with the bid set
38 documents and any published addenda.
39 B. The following documents shall be used to amend the submittals schedule as needed during the execution of this
40 contract.
41 1. Documents associated with revisions or clarifications to number A.1 above after awarding of the
42 contract, including but not limited to:
43 a. Construction Bulletins
44 b. Approved Change Orders
45
46

1.4. SUBMITTAL DEFINITIONS

- 47 A. Administrative Submittal: Any submittal that may be required by a Division 1 Specification and as noted in
48 Section 1.5 below.
49 B. Critical Path Submittal: Any early submittal that needs a priority review due to early construction use or long
50 lead times where a delay could affect the critical path of the construction schedule
51 C. Submittal: Any material, product, equipment, or general requirement as outlined in this and other specifications
52 that require a favorable review or acceptance prior to proceeding with procuring the item or proceeding with
53 the Work.
54
55

1 **1.5. SUBMITTAL REQUIREMENTS**

- 2 A. The GC and all Sub-contractors shall review the construction documents including the specifications of their
3 individual Division or Trade to compile a complete list of all materials, products, or equipment that will require a
4 positively reviewed submittal to be completed prior to procurement and installation.
5 1. Submittals shall include but not be limited to any of the following that may apply:
6 a. Shop Drawings
7 b. Product Data
8 c. Assembly Drawings
9 d. Engineered Drawings
10 e. Product Samples
11 B. The following items will require an approved submittal, verify with specifications for specific needs and
12 requirements:
13 1. Contractor certifications for specialized work such as asbestos removal, well drilling, controls, AV, etc.

14
15 **1.6. ADMINISTRATIVE SUBMITTALS**

- 16 A. The GC shall upload the following submittals within 15 working days of receipt of the City of Madison Start Work
17 Letter. All Administrative Submittals shall be approved prior to requesting Progress Payment Number 1.
18 1. Contractors Project Directory, see specification 01 31 23, discuss requirements with CPM
19 2. Schedule of Values, see Specification 01 29 73
20 3. Submittals Schedule, see Specification 01 32 19
21 4. Waste Management Plan, see Specification 01 74 19
22 5. Closeout Requirement Checklist, see Specification 01 77 00
23 6. Warranty Checklist, see Specification 01 78 36
24

25 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

26
27 **PART 3 - EXECUTION**

28
29 **3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS**

- 30 A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work
31 to provide a complete and comprehensive list of submittals to the General Contractor.
32 B. Each list shall indicate the title of the submittal, the associated specification of the submittal, whether the
33 submittal can be considered an early/middle/late submittal, the anticipated date the submittal will be provided
34 and the anticipated date the submittal needs to be approved.
35 C. Contractors shall be aware that the goals for submittal review by the Architect staff and City staff will be as
36 follows:
37 1. For items on the Critical Path as identified by the GC, five (5) working days
38 2. For most other submittals ten (10) working days
39 3. Additional time may be needed for complex submittals or if re-submittals are required.
40 D. The City will provide a spreadsheet to provide the format of the Submittal Schedule as part of the first
41 administrative submittals.

42 **3.2. GENERAL CONTRACTORS RESPONSIBILITIES**

- 43 A. The General Contractor shall be responsible for all of the following:
44 1. Consolidating all submittal lists from individual contractors into one master list with the provided
45 spreadsheet on the Project Management Web Site
46 2. Reviewing all submitted lists for completeness, timing with the overall contract, etc. The GC shall meet
47 with individual contractors to make changes as necessary.
48 3. Upload the completed Submittals Schedule to the Submittal Library on the Project Management Web Site
49 See Specification 01 33 23 Submittals for more information on this procedure.
50 4. Resubmit the schedule as needed after initial reviews have been completed.
51 B. The GC shall work with other contractors to amend the Submittals Schedule throughout the execution of the
52 project based on changes and modifications as needed.
53 C. The GC and Project Architect shall be responsible for reviewing and briefing the submittal schedule and
54 submittals status at each bi-weekly construction meeting.
55

- 1 **3.3. STAFF REVIEW RESPONSIBILITIES**
2 A. The Project Architect, consulting staff, Commissioning Agent (CxA), Owner, and city staff will review the
3 Submittal Schedule for completeness per the plans and specifications within their divisions of work. The
4 reviewing staff may provide comments as needed. Some examples might include the following:
5 1. Submittal not required
6 2. Provide photos of samples with digital submittal
7 3. Insure one submittal for complete system
8 4. Append the schedule to include...
9 5. See Specification for additional requirements
10 B. The Project Architect and City Project Manager will finalize review comments regarding the Submittal Schedule.
11 Re-submittal of the submittal schedule may be required.

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SECTION 01 32 23
SURVEY AND LAYOUT DATA

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PART 1 – GENERAL

1.1. SUMMARY

- 22 A. The purpose of this specification is to set forth the minimal required guidelines to be followed by the General
23 Contractor (GC) and the Land Surveyor (Surveyor) including but not limited to the following:
24 1. Surveyor Professional Requirements
25 2. Horizontal and Vertical Datum Control
26 3. Local Control (if any)
27 4. Electronic File and Data Requirements
28 5. As-Built Documentation Requirements
29 B. When working on any City of Madison project, OSHA standards must be complied with. The Surveyor shall
30 provide appropriate traffic control in accordance to the Manual on Uniform Traffic Control Devices (MUTCD).
31 C. The Surveyor shall be responsible for notifying Diggers Hotline in advance of beginning the field work for this
32 contract.
33

1.2. RELATED SPECIFICATIONS

- 34 A. Section 01 29 76 Progress Payment Procedures
35 B. Section 01 31 23 Project Management Web Site (PMWS)
36 C. Section 01 33 23 Submittals
37 D. Section 01 78 39 As-Built Drawings
38 E. Section 105.9, Survey Points and Instructions, of the City of Madison FACILITIES MANAGEMENT SPECIFICATIONS
39 for Public Works
40
41

1.3. SURVEYOR QUALIFICATIONS

- 42 A. The General Contractors, Land Surveyor Sub-Contractor shall meet or exceed the following:
43 1. The Principal Land Surveyor (PLS) shall be licensed to practice in the State of Wisconsin.
44 a. The PLS's license shall be current at the beginning of the contract and the PLS shall maintain an
45 active license throughout the execution of this contract.
46 2. The PLS shall have a minimum of minimum of ten (10) years of field experience on similar projects of
47 scope and size.
48 a. Land Surveyors working under the direction of the PLS shall have a minimum of five (5) years of field
49 experience on similar projects of scope and size.
50 B. The PLS shall be responsible for checking and verifying all work being performed under the PLS's direction during
51 the execution of this contract. This shall include but not be limited to periodic field checks of equipment and
52 survey data for accuracy and compliance with the contract documents.
53
54

1.4. QUALITY ASSURANCE

- 55 A. The PLS shall do all surveying in City of Madison Datum's as follows:
56 1. All Horizontal Control shall be in the Dane County Coordinates (WISCRS), NAD 83(1997) datum, US
57 Survey foot).
58

2. All Vertical Control shall be in NAVD88(1991).
3. Information on PLSS Section Corner Monuments and Tie Sheets can be found on the City Engineering Mapping website http://gis.cityofmadison.com/Madison_PLSS/PLSS_TieSheets.html.

1.5. SUBMITTALS

- A. After initial project setup the PLS shall provide the following information as a Survey Data Submittal for review by the CPM/CCM, and Owner. See Specification 01 33 23 – Submittals for more information.
 1. Copy of the PLS (and any supporting staff) current State of Wisconsin registration certificate/licenses.
 2. Digital Survey Submittal shall be uploaded to the Project Management Web Site. Submittal Survey shall be in Auto CAD format. Digital Submittal shall be of the project site setup showing all of the following:
 - a. Key features not scheduled for demolition, including but not limited to building corners, roof overhangs, and door locations.
 - b. Location of construction limits fencing.
 - c. Locations of PLSS and/or project control points provided by the Owner.
 - d. Locations of project based control points.
 3. Printed Survey Submittal shall be the same as item 1 above in PDF format. PDF file shall be formatted to print to scale on 24"x36" sheets as required to show all features with text neatly organized for each item identified. When multiple sheets are used a match line and sheet references shall be required.
 4. PDF file of the complete level/layer scheme. Scheme shall be in tabular form formatted to 8.5 by 11 paper and shall include all of the following:
 - a. Level/layer designation (abbreviation).
 - b. Level/layer designation (full title).
 - c. Feature attribute characteristics (line weight, line style, font, etc.).
 - d. Cell attribute information
 - e. Samples of line styles and cells.

1.6. EXAMINATION

- A. The PLS shall be responsible for verifying all site data including the owner provided local control points (see Section 3.1 below) prior to starting the Work.
- B. Notify the Project Architect and CPM/CCM immediately if any discrepancies are discovered.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. PRE-CONSTRUCTION OWNER SUPPORT

- A. The CPM/CCM shall provide the GC/PLS with a digital CAD seed file on or before the Pre-construction meeting.
 1. Seed file shall be an Auto Cad seed file using the datum indicated above. Seed file shall be delivered as a Auto Cad format as requested by the PLS.
 - a. Seed file shall be used as the PLS's initial base file for all future work on this contract.

3.2. UTILITY LOCATING

- A. The GC and/or PLS shall be responsible for notifying Diggers Hotline for all utility locate requests.

3.3. SURVEY CONTROL AND LAYOUT DATA

- A. The GC and PLS are responsible for all other survey control and layout data required to perform the work in this contract.

3.4. TOPOGRAPHIC SURVEYING

- A. The Surveyor may perform the topographic survey with properly calibrated equipment as follows:
 1. Total station, achieving minimum accuracy for well-defined features of +/- 0.1 feet horizontal and +/-0.04 feet vertical at 95% confidence relative to control. "Well defined features" shall include but not be limited to property irons, pavements, trees, landscaping features, buildings, utility locations, and other permanent features.
 2. RTK GPS shall be permitted in large open areas, along tree lines, and in brushy areas.

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3.5. SITE SURVEY AS-BUILT

- A. See Specification 01 78 39 As-Built Drawings, Section 3.2 for more information on required record site information to be provided prior to contract closeout.
- B. The GC shall be responsible for scheduling the PLS to capture locations and depths of all buried utilities prior to any contractor back filing trenches. The Owner may require missing information to be located and surveyed at the GC's expense.

END OF SECTION

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**SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING**

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PART 1 – GENERAL

1.1. SUMMARY

- A. Daily records of project activities, resources used, weather conditions, and other information related to the ongoing progress of the project are extremely important at all levels of Construction Management.
- B. Daily records provide the base for weekly progress reports and updating progress schedules.

1.2. RELATED SPECIFICATION SECTIONS

- A. Section 01 31 19 Project Meetings
- B. Section 01 31 23 Project Management Web Site
- C. Section 01 32 23 Photographic Documentation

1.3. PERFORMANCE AND QUALITY ASSURANCE REQUIREMENTS

- A. The General Contractor (GC) shall be responsible for all Construction Progress Reporting as outlined in this and other specifications as noted.
- B. The GC shall maintain daily progress journals in a format of their choosing provided it is legible and contains the information as outlined in Section 3.1 below.
- C. The journal shall be located in the job trailer and shall be reviewable by the Project Architect or City Project Manager if so requested.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONTRACTOR JOURNAL

- A. The GC shall maintain a journal of daily progress on which Work is performed by any employee or entity for which the GC is responsible. Such reports shall include all relevant data concerning the progress of Work activities the GC and Subcontractors are responsible for and the effect of that activity on the time of performance of the Contract.
 - 1. Some projects may not require weekly journals be kept instead of daily journals. This is at the sole discretion of the City Project Manager. A daily journal will generally be required when the contract has a significant amount of site work. A weekly journal will generally be used when a contract is interior work only.
- B. Journal entries shall be made in the Project Management Web Site. The form consists of the following areas:
 - 1. Weather; include temperature, humidity, precipitation, wind and other related information such as significant storm events, times, and details.
 - 2. Work completed by trade
 - 3. Delays encountered
 - 4. Deliveries received or delayed
 - 5. Hot issues that need to be addressed
 - 6. Safety issues
 - 7. Photograph progress and upload to the Photo Library on the Project Management Web Site.
 - 8. Other including inspections, testing, etc.
 - 9. Space for attaching documents
- C. Contractor Daily/Weekly Report Forms shall be completed and signed by the GC’s Job Superintendent or other on-site representative authorized by the GC confirming each such report is current, accurate and complete.

1 D. If applicable the GC shall include schedules of quantities and costs, progress schedules, wage rates, reports,
2 estimates, invoices, records and other data as requested by the CPM concerning Work performed or to be
3 performed under this Contract if the CPM determines such information is needed to substantiate Change Order
4 proposals, claims, or to resolve disputes.
5

6 **3.2. CONSTRUCTION PROGRESS MEETINGS**

7 A. The GC shall provide a verbal summary of the previous two (2) weeks progress reports at each bi-weekly
8 construction progress meeting.
9

10 **END OF SECTION**
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**SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION**

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PART 1 – GENERAL

1.1. SCOPE

- A. The General Contractor (GC) shall be required to take weekly digital photographs of interior and exterior construction progress and upload the photos directly to the Project Management Web Site (PMWS).
- B. The GC shall be required to provide digital time-lapse photo service of the project exterior -or interior when applicable- construction progress. Exterior or interior location determination to be confirmed with City Construction Manager.

1.2. RELATED SPECIFICATION SECTIONS

- A. Section 01 29 76 Progress Payment Procedures
- B. Section 01 31 23 Project Management Web Site (PMWS)
- C. Section 01 32 19 Submittals Schedule
- D. Section 01 32 33 Submittals
- E. Section 01 77 00 Closeout Procedures

1.3. SUBMITTALS

- A. The GC shall provide general information on the type of camera being used for interior and exterior digital photographs.
 - 1. Information may be written on Contractor’s transmittal sheet.
 - a. Include camera name/type, aspect ratio setting, and average file size
 - b. Provide sample project pictures as part of PDF submittal.
- B. The GC shall provide sufficient information on the type of time lapse system being used that meets the requirements identified in section 2.2 below.

PART 2 – PRODUCTS

2.1. DIGITAL CAMERA

- A. All digital photographs shall be taken with a good quality digital camera, cell phone, tablet, and other such digital device.
- B. Digital photographs shall be formatted to achieve a good, clear, and detailed image where the final file size is between 600 KB and 3.0 MB (3000KB).

2.2. TIME LAPSE CONSTRUCTION CAMERA (TLCC)

- A. The TLCC shall be a high quality weather proof camera owned and operated, or leased, by the GC for the duration of this contract with the following minimum capabilities:
 - 1. Pan-Tilt-Zoom (PTZ) capable.
 - 2. Wireless internet or built in cellular technology capable.
 - a. The use of memory cards will not be permitted.
 - 3. Widescreen, high resolution (5-30 MP rating).
 - 4. Powered by 120V AC.
 - a. The use of battery packs will not be permitted.
 - 5. Web/cloud hosted access to archived photos and video.
 - 6. Provides complete time lapse video capability.

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- 7. 24/7 service and support for equipment, software, and hosting services.
 - B. Approved equipment/services include but are not limited to the following:
 - 1. OxBlue Corporation www.oxblue.com
 - 2. EarthCam www.earthcam.net
 - 3. TrueLook www.truelook.com
 - 4. Evercam www.evercam.com

PART 3 – EXECUTION

3.1. REQUIREMENTS FOR DIGITAL PHOTOGRAPHS

- A. The GC shall take a minimum of two (2) exterior photographs each week. Exterior photographs will not be required on projects that do not include any exterior work.
 - 1. Exterior photos shall be taken from approximately the same location each week for the duration of the project.
 - 2. When applicable this requirement shall begin prior to commencing any site work.
 - 3. This requirement shall only be applicable when there is exterior work actively being conducted with the project. Periods of inactivity due to weather (winter conditions) do not require a photograph.
 - 4. This requirement shall end when the exterior work has been substantially completed.
 - 5. This requirement may be suspended due to weather conditions or substantial delays in exterior progress.
- B. The GC shall take interior photographs each week that document interior construction progress.
 - 1. This requirement will begin when exterior wall framing begins.
 - a. When an interior remodeling project includes demolition work interior photos shall be taken during the demolition process.
 - 2. Pictures do not need to be taken from the same location each week.
 - 3. This requirement shall end when the interior work has been substantially completed.
- C. Digital photographs shall be properly zoomed in/out, and flash used as needed, to capture a level of detail required to properly show the progress being captured by the photograph.
 - 1. Blurry and dark pictures will not be accepted.
- D. The camera default naming convention is acceptable. The GC does not need to rename or specifically identify pictures with a title.
- E. All digital photographs shall be saved in a JPEG (.jpg) format and uploaded directly to the Project Management Web Site.

3.2. REQUIREMENTS FOR TIME LAPSE PHOTOGRAPHS

- A. The GC shall be responsible for all of the following:
 - 1. Install an approved operation timelapse camera within 30 days after date fixed by Start Work Letter and/or Notice to Proceed
 - 2. Verify with the CPM/CCM a suitable place for mounting the camera and related equipment prior to installation.
 - 3. The complete installation, setup, maintenance, and removal of the camera and related equipment.
 - 4. The hosting and access of all photographs and videos taken by the camera during the project.
 - 5. Production of a final time lapse video (minimum of 3 minutes in length) of the project provided in a viewable format to the Owner on a thumb drive or CD.
- B. Time lapse photos shall be taken from the same fixed position at approximately ten (10) minute intervals.
 - 1. Time lapse shall start before normal daily activities begin and end after normal daily activities have been completed.
 - a. The GC shall adjust the camera time lapse schedule as needed to accommodate any periods of overtime or weekend work.
 - b. Time lapse shall not be taken during major periods of no activity including night hours, holidays, weather related (winter) inactivity, etc.
- C. All photos taken during the execution of this contract shall be accessible from a web-based service. Archived photos shall be organized by date and time so that they can be easily retrieved and viewed as needed.
 - 1. If necessary, the GC shall coordinate usernames and passwords for access to the photos. The City of Madison would prefer that the access be generic to accommodate a wide audience.

END OF SECTION

SECTION 01 33 23
SUBMITTALS

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PART 1 – GENERAL

1.1. SUMMARY

- 17 A. The General Contractor (GC) shall be responsible for providing submittals for review of all contractors and sub-
18 contractors as designated in the construction documents. Submittals shall include but not be limited to all of the
19 following:
20 1. Equipment specified and pre-approved in the specification; to ensure quality, construction, and
21 performance specifications have not changed since final design.
22 2. Equipment specified by performance in the specification; to ensure that the intended quality,
23 construction, and performance specified is met by the selected material or product.
24 3. Shop, piece, erection, and other such drawings as indicated in the specifications to ensure all structural,
25 dimensional, and assembly requirements are being met.
26 4. Submittals indicating installation sequencing
27 5. Submittals indicating control sequencing
28 6. Contractor licensing, certification, and other such regulatory documentation when required by a
29 specification.
30 7. Other submittals as may be required by individual specifications.
31 B. The submittal process shall not be used to determine alternates to specified products or equipment. All
32 considerations shall be reviewed during the bidding process and acceptable alternates shall be acknowledged by
33 addendum prior to the closing of bidding. See bidding instructions for the information on submitting alternates
34 for consideration.
35 D. In the event that a manufacturer has significantly changed a product (discontinued a model, changed dimension
36 or performance data changed available colors, etc.) since bid opening the GC shall submit a Request for
37 Information (RFI) to the Project Architect requesting other approved alternates prior to uploading a digital
38 submittal.
39 E. Contractors and sub-contractors shall be responsible for knowing the submittal requirements of ALL sections
40 within their scope of work under the contract. The Owner reserves the right to request documentation on any
41 materials, equipment, or product being installed where a submittal is not on file. If the material, equipment, or
42 product installed is determined not to meet the intent of the specification the contractor/sub-contractor shall be
43 required to remove and replace the items involved. The GC shall be solely responsible for all costs associated
44 with the removal and replacement.
45 F. Doors, Frames + Hardware Submittals - After submission of all door/frame/hardware submittals (and related low
46 voltage door hardware submittals) Contractor will organize a meeting(s) with Owner, Architect, General
47 Contractor, Electrician, Door/Frame/Hardware Supplier(s)/Installer(s), Low-Voltage Supplier/Installer, and others
48 as applicable to comprehensively review and explain each door opening’s submitted hardware package
49 operation. Prior to this meeting the low voltage contractor shall have completed a review with the Madison Fire
50 Department for all access control doors and be prepared to explain any conflicts or concerns with all parties. No
51 procurement of door hardware (and related low voltage components) shall be procured until this meeting is
52 completed; and until related submittals are returned to by the Owner/Architect team.

1.2. RELATED REFERENCES

- 54 A. Section 01 29 76 Progress Payment Procedures
55 B. Section 01 31 23 Project Management Web Site (PMWS)
56 C. Section 01 32 19 Submittals Schedule
57 D. Section 01 32 26 Construction Progress Reporting
58 E. Section 01 91 00 Commissioning

- 1 F. All Technical Specifications, contract documents, construction drawings, and any published addendums during
- 2 the bidding process.
- 3 G. All contract documents generated during the execution of the contract including but not limited to Requests for
- 4 Information (RFI) and Construction Bulletins (CB).
- 5

6 **1.3. SUBMITTAL REQUIREMENTS**

- 7 A. A completed submittal shall meet the following requirements:
 - 8 1. Digital submittal shall be original PDF of manufacturer's data sheets or high quality color scan of the
 - 9 same.
 - 10 a. Submittals shall not include sales fliers or other similar documents that typically do not provide
 - 11 complete manufacturers data.
 - 12 2. Documents within the PDF submittal shall be printable to a sized sheet no less than 8-1/2 by 11 inches
 - 13 and no larger than 24 by 36 inches.
 - 14 3. At the beginning of each submittal the contractor shall identify the plan reference (WC-1, EF-3, etc.) in
 - 15 RED block letters that the submittal is for.
 - 16 4. Where multiple model numbers appear in a table the contractor shall identify the specific model being
 - 17 submitted by using a RED square, box, or other designation to distinguish the correct model from others
 - 18 on the page.
- 19 B. A complete submittal will include all information associated with the product or equipment as presented in
- 20 plans, equipment tables, and specifications. Information shall include but not be limited to the following:
 - 21 1. Dimensional data
 - 22 2. Performance data
 - 23 3. Resource requirements, power, water, waste, etc.
 - 24 4. Clearance and maintenance requirements
 - 25 5. Finish information, colors, textures, etc.
 - 26 6. Warranty information
- 27 C. Where a submittal includes material samples (carpet, tile, paint draw downs, etc.) the contractor shall do the
- 28 following:
 - 29 1. The Contractor shall submit the sample(s) as indicated in the specification.
 - 30 2. The Contractor shall include a quality photograph(s) of the product with the digital submittal.
 - 31 Photographs shall meet the following requirements:
 - 32 a. Formatted to be between 500Kb and 1.0 Mb in file size
 - 33 b. Have no glare or flash reflection on the sample
 - 34 c. Sample fills the frame of the photo and shows detail as needed. Include multiple photos from
 - 35 other angles as needed.
 - 36 d. Scanned copies of products or photos are not acceptable.
- 37 D. Uploaded submittals should be relative and related to a specific written specification.
 - 38 1. Do not upload submittals under a broad category or division (I.E. HVAC 23 00 00). Always upload by the
 - 39 specific specification that identifies a required product or performance to be met.
 - 40 2. Group related items together if the specification is written that way. (I.E. all of the plumbing fixtures and
 - 41 trim relative to one specific specification should be submitted together).
 - 42 3. Submittals shall be grouped and adhere to the divisions in the submittal schedule. Submittals that do not
 - 43 conform to the submittal schedule and/or specification divisions will be rejected for re-submittal.
 - 44

45 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

46

47 **PART 3 - EXECUTION**

48

49 **3.1. GENERAL CONTRACTOR'S PROCEDURES**

- 50 A. All required submittals will be uploaded to the Project Management Web Site (PMWS) by the GC.
 - 51 1. Fill in required information on the form that will be used for routing the review and comments.
 - 52 2. Attach all documentation as described in Section 1.3 above.
 - 53 a. Submit samples under separate cover to the Project Architect when necessary.
- 54 B. Uploading the submittal indicates that the GC has reviewed and approved the submittal against the contract
- 55 document requirements.
- 56 C. The GC shall discuss submittal status at all progress meetings and shall monitor submittal review/approval/re-
- 57 submittal so as to not incur delays in the project schedule.
- 58 D. A completed upload of the submittal to the PMWS initiates the review process workflow.

1 E. The GC and sub-contractors shall provide re-submittals as required.
2

3 **3.2. SUBMITTAL REVIEW**

- 4 A. Upon completion of the submittal upload by the GC the PMWS automatically notifies the appropriate
5 Architect/Engineer and Owner Representative, including CxA, by Division/Specification number that there is a
6 submittal for review.
7 B. The submittal shall be reviewed internally by the required Architect/Engineer and Owner Representative and
8 CxA in a timely fashion and provide commentary on missing items, incorrect information, or incomplete shop
9 drawings, etc as needed.
10 C. When the internal review is completed the PMWS will notify the Project Architect the submittal is ready for final
11 review.
12

13 **3.3. PROJECT ARCHITECT'S REVIEW**

- 14 A. Upon completion of the internal review the Project Architect shall review all internal review comments, confer
15 with the CPM and CxA as needed and determine the appropriate disposition status for the submittal (approved
16 or resubmit).
17 B. The Project Architect shall summarize final internal review comments onto the submittal cover sheet, provide a
18 final disposition of the submittal and update the review status of the submittal to "Complete..." (with or w/o
19 comments) or "Rejected".
20 C. A completed Final Review status will be completed by the City Project or City Construction Manager and initiates
21 the PMWS to notify the GC and appropriate sub-contractor(s) that the review of the submittal has been
22 completed.
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END OF SECTION

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**SECTION 01 43 39
MOCKUPS**

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17

PART 1 – GENERAL

1.1. SUMMARY

- A. Definition
- Mockups are field samples constructed, applied, or assembled at the project site for review by the Owner, Owners Representative, Architect and Consultants.
 - Mockups are three dimensional, true scale models that illustrate materials and methods, equipment, workmanship, or location; based on plans, details, and assemblies.
- B. Approved mockups establish the standard of quality by which the final work will be judged.
- C. Approved mockups shall be properly documented and entered into the Submittal Library on the Project Management Web Site like any other required submittal. See section 3.4 below for more information.

1.2. RELATED SPECIFICATIONS

- A. Section 01 26 13 Request for Information (RFI)
- B. Section 01 26 46 Change Bulletin (CB)
- C. Section 01 26 63 Change Order (CO)
- D. Section 01 31 19 Project Meetings
- E. Section 01 32 16 Construction Progress Schedules
- F. Section 01 33 23 Submittals
- G. Section 01 45 00 Quality Control

1.3. RELATED DOCUMENTS

- A. The following documents shall be used for preparing mockups.
- All plans, specifications, and details including those derived as revisions (RFI, CB, CO).
 - Construction Progress Schedules. Mockups shall be done and completed in a timely fashion for review and approval so as to not impact the Contractors project schedule.
 - Any Manufacturers installation/assembly instructions.

1.4. PERFORMANCE REQUIREMENTS

- A. All Contractors shall be responsible for providing and constructing mockups as specified in their Division of Work in the plans and specifications.
- B. Materials to be used shall be as specified in the construction documents, full sized and properly assembled.
- C. Completed mockups shall be of sufficient size to provide visible detail of all components as needed for the sample.

1.5. QUALITY ASSURANCE

- A. The General Contractor (GC) shall be responsible for coordinating all of the following as needed:
- Designating the location for the mockup construction
 - Coordinating the work of all contractors and materials required to complete the mockup
 - Ensuring that the mockup meets the intent of the construction documents before scheduling the mockup review meeting.

1
2 **PART 2 - PRODUCTS**
3

4 **2.1. MATERIALS**

- 5 A. The materials used in mockups shall be only those materials indicated in the plans, specifications, and favorably
6 reviewed submittals.
7 B. Mockups shall be made of full scale materials as delivered to the project site.
8 C. All materials associated with a particular detail, construction method, manufacturer's installation instructions
9 shall be properly represented and visible in the mockup. This includes but is not limited to finished mortar joints,
10 sealants, backer rods, tie bars, rebar, etc.
11

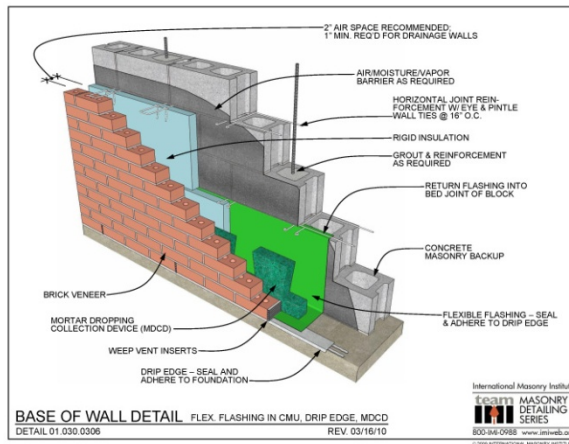
12 **PART 3 - EXECUTION**
13

14 **3.1. REVIEW THE PLANS AND SPECIFICATIONS**

- 15 A. The GC shall review the plans and specifications with all required contractors prior to constructing the mockup.
16 1. Mockups that will be built and remain in place, if favorably reviewed, will be installed in an area easily
17 accessible for review.
18 2. Mockups that will not be built in place or will not remain will be constructed in a space on the project site
19 protected from weather, construction traffic, and other such disturbances until such time as the
20 associated work has been completed.
21 3. Insure all products being represented in the mockup meet the plans, specifications, and any published
22 changes.
23

24 **3.2. MOCKUP CONSTRUCTION**

- 25 A. Mockups shall be of sufficient size to show various material adjacencies, connectivity, patterns, and other such
26 related features.
27 B. Mockups shall be constructed in a layered fashion so that all products being used can be seen and evaluated.
28 C. The construction detail below is an example of a properly layered mockup.
29



- 30
31 D. Sections required as part of mockup:
32 1. 04 20 00 – Unit Masonry.
33 2. 04 72 00 – Cast Stone Masonry.
34 3. 06 16 00 – Sheathing.
35 4. 07 14 16 – Cold Fluid Applied Waterproofing.
36 5. 07 21 00 – Thermal Insulation.
37 6. 07 27 26 – Fluid-Applied Membrane Air Barrier.
38 7. 07 42 13.23 – Metal Composite Material Wall Panels.
39 8. 07 46 19 – Preformed Steel Siding.
40 9. 07 62 00 – Sheet Metal Flashing and Trim.
41 10. 07 92 00 – Joint Sealants.

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3.3. MOCKUP REVIEW

- A. The General Contractor and all associated Sub-contractors (Contracting Team) shall meet with the Owner, Owners Representative, Architect and Consultants (Design Team) as necessary to review the mock-up. Contractors shall be prepared to answer questions on materials and methods as necessary.
- B. The Contracting and Design Teams shall review the mockup in detail for materials, methods, and workmanship with respect to the intent of the contract documents. Improvements or adjustments shall be discussed as needed.
- C. If the mockup is incomplete or does not show sufficient detail of products and workmanship the General Contractor shall resubmit a new mockup.
- D. Re-submittal of mockups to meet the intent of the contract documents shall be the responsibility of the General Contractor. No Change Orders will be processed for additional time or materials associated with re-submitting a mockup for approval.
 - 1. In the event that a submitted mockup meets the criteria of the contract documents but does not meet the expectations of the design team and alternative methods or materials are discussed the following procedure shall be used:
 - a. Project Architect shall publish a Construction Bulletin (CB) to detail the required/recommended changes.
 - b. The GC shall prepare and submit a new mockup.

3.4. FINAL SUBMITTAL

- A. The field approved mockup shall be submitted by the General Contractor as any other submittal for project documentation purposes. The mockup submittal shall consist of the following:
 - 1. Digitally photograph the field approved mockup. Take as many detailed photos as necessary to capture the complexity of the mockup.
 - 2. Provide a written summary of the approved mockup. Include all recommended adjustments, level of expected workmanship, and other such detail as discussed during the mockup review.
 - 3. Submit the mockup to the Project Management Web Site. See Specification 01 33 23 Submittals for additional information.

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**SECTION 01 43 50
AIR BARRIER SYSTEMS**

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16

PART 1 – HEADING 1

1.1. RELATED DOCUMENTS

- 19 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division
20 01 Specification Sections, Division 07 Specification Sections, apply to this Section.
21
22

1.2. SUMMARY

- 23 A. Contractor will engage a qualified consultant(s) to perform tests and inspections prior to the installation of air
24 barrier components.
25 B. This section includes administrative and procedural requirements for accomplishing an airtight building
26 enclosure that controls infiltration or exfiltration of air.
27 C. Related Sections:
28 1. Section 07 25 00: Weather Barriers.
29 2. Requirements of this section relate to the coordination between subcontractors required to provide an
30 airtight building enclosure, customized fabrication and installation procedures, not production of
31 standard products.
32
33

1.3. DEFINITIONS

- 34 A. Air Barrier System: The airtight components of the building enclosure and the joints, junctures and transitions
35 between materials, products, and assemblies forming the air-tightness of the building enclosure.
36 B. Services: Include coordination between the trades, the proper scheduling and sequencing of the work, pre-
37 construction meetings, inspections, tests, and related actions, including reports performed by Contractor, by
38 independent agencies, and by governing authorities. They do not include contract enforcement activities
39 performed by Architect.
40
41

1.4. PERFORMANCE REQUIREMENTS

- 42 A. General Performance: The Contractor shall ensure that the intent of constructing the building enclosure with a
43 continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The air
44 barrier system shall have the following characteristics:
45 1. It shall be continuous, with all joints sealed.
46 2. It shall be structurally supported to withstand positive and negative air pressures applied to the building
47 enclosure.
48 3. Continuity of the air barrier materials and products with joints to provide complete assemblies.
49 4. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole building
50 air barrier system.
51 B. Connection shall be made between:
52 1. Foundation and walls.
53 2. Walls and windows or doors.
54 3. Different wall systems.
55 4. Wall and roof.
56 5. Wall and roof over unconditioned space.
57 6. Walls, floor and roof across construction, control and expansion joints.
58

- 1 7. Walls, floors and roof to utility, pipe and duct penetrations.
2 C. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be made
3 air-tight.
4 D. Compliance Requirements:
5 1. Assemblies: an air permeance not to exceed 0.03 cfm/ft²p under a pressure differential of 0.3 in. water
6 (1.57psf) (0.15 L/s.m² @ 75 Pa) when tested in accordance with ASTM E 1677.
7 2. Materials: Materials used for the air barrier system in the opaque envelope shall have an air permeance
8 not to exceed 0.004 cfm/ft² under a pressure differential of 0.3 in. water (1.57psf) (0.02 L/s.m² @ 75 Pa)
9 when tested in accordance with ASTM E 2178. Or,
10 3. Entire Building: The air leakage of the entire building shall not exceed 0.15 cfm/sf under a pressure
11 differential of 0.3 in. water (1.57psf) (0.75 L/s.m² @ 75 Pa) when tested according to ASTM E 779.
12

13 **1.5. SUBMITTALS**

- 14 A. Field quality-control reports.
15 B. Testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to
16 the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of
17 each inspection, test, or similar service through the Contractor.
18 1. Submit additional copies of each written report directly to the governing authority, when the authority so
19 directs.
20 C. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the
21 following:
22 1. Date of issue.
23 2. Project title and number.
24 3. Name, address, and telephone number of testing agency.
25 4. Dates and locations of samples and tests or inspections.
26 5. Names of individuals making the inspection or test.
27 6. Designation of the Work and test method.
28 7. Identification of product and Specification Section.
29 8. Complete inspection or test data.
30 9. Test results and an interpretation of test results.
31 10. Ambient conditions at the time of sample taking and testing.
32 11. Comments or professional opinion on whether inspected or tested Work complies with Contract
33 Document requirements.
34 12. Name and signature of laboratory inspector.
35 13. Recommendations on retesting.
36

37 **1.6. QUALITY ASSURANCE**

- 38 A. General Performance: The Contractor shall ensure that the intent of constructing the building enclosure with a
39 continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The air
40 barrier system shall have the following characteristics:
41 B. Inspection and testing services are required to verify compliance with requirements specified or indicated. These
42 services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
43 1. Qualifications for Air Barrier Testing and Inspection Agencies: Engage Air Barrier inspection and testing
44 service agencies, including independent testing laboratories, that are prequalified and that specialize in
45 the types of air barrier system inspections and tests to be performed.
46 C. Specific quality-control requirements for individual construction activities are specified in the sections of the
47 specifications. Requirements in those sections may also cover production of standard products. It is the
48 Contractor's responsibility to ensure that each subcontractor is adequately and satisfactorily performing the
49 quality assurance documentation, tests and procedures required by each section.
50 D. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that
51 facilitate compliance with Contract Document requirements.
52

53 **1.7. PROJECT CONDITIONS**

- 54 A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity,
55 Contractor shall provide coordination of the trades, and the sequence of construction to ensure continuity of the
56 air barrier system joints, junctures and transitions between materials and assemblies of materials and products,
57 from substructure to walls to roof. Provide quality assurance procedures, testing and verification as specified
58 herein. Facilitate inspections, tests, and other quality-control services specified elsewhere in the Contract

- 1 Documents and required by authorities having jurisdiction or by the Owner. Costs for these services are included
2 in the Contract Sum.
- 3 B. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to
4 discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight
5 joints, junctures, and transitions between materials, products and assemblies of products specified in the
6 different sections, to be installed by the different trades.
- 7 C. Build a mock-up before proceeding with the work, satisfactory to the Architect, of each airtight joint type,
8 juncture, and transition between products, materials and assemblies.
- 9 D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and
10 provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to
11 permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
12 1. Provide access to the Work.
13 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
14 3. Take adequate quantities of representative samples of materials that require testing or assist the agency
15 in taking samples.
16 4. Deliver samples to testing laboratories.
17 5. Provide security and protection of samples and test equipment at the Project Site.
- 18 E. Duties of the Testing and Inspection Agency: The independent agency engaged to perform inspections, sampling,
19 and testing of air barrier materials, components and assemblies specified in individual Sections shall cooperate
20 with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide
21 qualified personnel to perform required inspections and tests.
22 1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies
23 observed in the Work during performance of its services.
24 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract
25 Documents or approve or accept any portion of the Work.
26 3. The agency shall not perform any duties of the Contractor.
- 27 F. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay.
28 Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections
29 and tests.
30 1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar
31 activities.
32

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. FIELD QUALITY CONTROL

- 38 A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- 39 B. Tests and Inspections:
- 40 1. Qualitative Testing and Inspection:
- 41 a. Daily reports of observations, with copies to the Owner, Contractor and Architect.
- 42 b. Continuity of the air barrier system throughout the building enclosure with no gaps, holes.
- 43 c. Structural support of the air barrier system to withstand design air pressures.
- 44 d. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions and mortar
45 droppings, with mortar joints struck flush, or as required by the manufacturer of the air barrier
46 material.
- 47 e. Site conditions for application temperature and dryness of substrates.
- 48 f. Maximum length of exposure time of materials to ultra-violet deterioration.
- 49 g. Surfaces are properly primed.
- 50 h. Laps in material are 2" minimum, shingled in the correct direction (or mastic applied on exposed
51 edges), with no fishmouths.
- 52 i. Mastic applied on cut edges.
- 53 j. Roller has been used to enhance adhesion.
- 54 k. Measure application thickness of liquid-applied materials to manufacturer's specifications for the
55 specific substrate.
- 56 l. Materials used for compatibility.
- 57 m. Transitions at changes in direction, and structural support at gaps.

- 1 n. Connections between assemblies (membrane and sealants) for cleaning, preparation and priming
2 of surfaces, structural support, integrity and continuity of seal.
3 o. All penetrations sealed.
- 4 A. Testing Standards:
- 5 1. ASTM E 1186-03, (Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier
6 System.) Section 4.2.7 (Chamber Depressurization in Conjunction with Leak Detection Liquid.)
7 1) Applicable Sections:
8 a) **07 27 26 – Fluid-Applied Membrane Air Barriers**
9 b) **07 54 23 – TPO Roofing**
10 2) Test Schedule: After all specified coats of fluid barrier applied or membrane adhered and
11 manufacturer’s required curing time has elapsed, before installation of exterior continuous insulation
12 3) Test Quantity: 2 sets of 25 per barrier type, as directed by Owner, BCxP, and Architect
13 4) Pass Criteria: no visible bubbles in the testing fluid
- 14 2. ASTM D 4541-95, (Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion
15 Testers.)
16 1) Applicable Sections:
17 a) **07 25 00 – Weather Barriers (Building Wrap Only)**
18 b) **07 27 26 – Fluid-Applied Membrane Air Barriers**
19 2) Test Schedule: After all specified coats of air barrier are applied and cured, before the installation of
20 exterior cladding.
21 3) Test Quantity: Minimum 3 locations per barrier type, as directed by Owner, BCxP, and Architect
22 4) Pass Criteria: 5% greater than manufacturer’s stated ultimate elongation
- 23 3. AAMA 501.2, (Quality Assurance and Diagnostic Water Leakage Field Check)
24 1) Applicable Sections:
25 a) **07 42 13.23 – Metal Composite Material Wall Panels**
26 b) **08 45 23 – Fiberglass Sandwich Panel Wall System**
27 c) **08 41 14 – Glazed Aluminum Storefronts and Entries**
28 2) Test Schedule: At 10% and 50% installation completion, prior to installation of interior finishes,
29 performing out of sequence work as required to facilitate testing schedule.
30 3) Test Quantity: 200’ linear per round (up to 400’ total), as directed by Owner, BCxP, and Architect
31 4) Pass Criteria: No visible water intrusion
- 32 4. ASTM E7877 (Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof
33 Membranes, low-voltage)
34 1) Applicable Sections:
35 a) **07 14 16 – Cold Fluid-Applied waterproofing**
36 b) **07 54 23 – TPO Roofing**
37 2) Test Schedule: At 10% TPO membrane installation completion, after membrane adhered, joints
38 taped/waterproofed, and manufacturer’s required curing time has elapsed, before installation of
39 exterior continuous insulation
40 3) Test Quantity: 2 tests, as directed by Owner, BCxP, and Architect
41 4) Pass Criteria: No leaks detected
- 42 5. ASTM D 8231 – 19, (Standard Practice for the Use of a Low Voltage Electronic Scanning System for
43 Detecting and Locating Breaches in Roofing and Waterproofing Membranes)
44 a) **07 54 23 – TPO Roofing**
45 2) Test Schedule: At 100% TPO membrane installation completion, after membrane adhered, joints
46 taped/waterproofed, and manufacturer’s required curing time has elapsed, before installation of
47 exterior continuous insulation
48 3) Test Quantity: 1 test
49 4) Pass Criteria: No leaks detected
- 50 6. ASTM C1193, Method A (Field-Applied Sealant Joint Hand Pull Tab) – OR – ASTM C1521, Method A
51 (TaiProcedure)
52 1) Applicable Sections:
53 a) **07 92 00 – Joint Sealants**
54 2) Test Schedule: After joint sealant applied and cured, before the installation of exterior cladding.
55 3) Test Quantity: 10 tests for the first 1000’ of joint length for each unique combination of of sealant
56 and substrate, and 1 test per 1000’ thereafter.
57 4) Pass Criteria: 5% greater than manufacturer’s stated ultimate elongation

7. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) **Per Section 014350, Part 3.1.B.3.i)**
 - 1) Applicable Sections:
 - a) **08 11 13 – Hollow Metal Doors (exterior doors only)**
 - b) **08 31 13 – Access Doors and Frames**
 - c) **08 31 23 – Coiling Overhead Doors**
 - d) **08 36 00 – Sectional Overhead Doors**
 - e) **08 41 13 – Aluminum-Framed Entrances and Storefronts**
 - f) **08 42 29.23 – Sliding Automatic Entrances**
 - 2) Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total), performing out of sequence work as required to facilitate testing schedule.
 - 3) Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect
 - 4) Pass Criteria:
 - a) Storefront: 0.15 cfm/sf at 6.27 PSF test pressure
 - b) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure
 - c) Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure
8. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
 - 1) Applicable Sections:
 - a) **08 11 13 – Hollow Metal Doors (exterior doors only)**
 - b) **08 31 13 – Access Doors and Frames**
 - c) **08 31 23 – Coiling Overhead Doors**
 - d) **08 36 00 – Sectional Overhead Doors**
 - e) **08 41 13 – Aluminum-Framed Entrances and Storefronts**
 - f) **08 42 29.23 – Sliding Automatic Entrances**
 - 2) Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total), performing out of sequence work as required to facilitate testing schedule.
 - 3) Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect
 - 4) Pass Criteria:
 - a) Storefront: 0.15 cfm/sf at 6.27 PSF test pressure
 - b) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure
 - c) Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure
9. ASTM E 779, (Standard Test Method for Determining Air Leakage Rate by Fan Pressurization) – **OR** – ASTM E 1827 (Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door)
 - 1) Test Schedule: Perform test twice: (1) at mid-construction after completion of exterior air barrier, but prior to interior finishes to permit diagnosis upon test failure, performing out of sequence work as required to facilitate testing schedule. (1) just prior to substantial completion.
 - 2) Pass Criteria: 0.1 cfm / sqft at 50 Pa test pressure

3.2. REPAIR AND PROTECTION

- A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

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SECTION 01 45 16
FIELD QUALITY CONTROL PROCEDURES

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract
22 signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are
23 delivered for the contracted Work.
24 1. The Project Management Web Site is a Construction Management tool that provides contractors and
25 staff a single on-line location for the daily operations and progression of the Work.
26 2. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it
27 progresses. The City of Madison does not use a “Punch List” or “Corrections List” as it is typically known
28 throughout the construction industry. The QMO process acts as an “in progress punch list”.
29 a. By using the QMO process the City of Madison’s goal is to have a zero item punch list prior to the
30 90% progress payment and owner occupancy.
31 B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related
32 specifications identified therein to become familiar with the terminology and expectations of this City of
33 Madison Public Works contract.
34 C. It is the intent of this specification to outline the requirements, expectations, and responsibilities of the General
35 Contractor (GC), Project Architect, and other representatives of the Owner for items of Quality Assurance and
36 Quality Control.
37 1. This specification is not intended to conflict with Specification 01 40 00 Quality Requirements or other
38 specifications requiring testing and inspecting services.
39 2. This specification does not relieve the GC from any requirements associated with regulatory inspections
40 performed by the City of Madison Building Inspection Unit, or inspectors from other agencies as required
41 by code.
42 3. Any testing performed by an Owner’s Representative does not relieve the GC from performing any
43 testing that may be required by the construction documents.
44

1.2. RELATED SPECIFICATION SECTIONS

- 46 A. Section 01 26 13 Request for Information (RFI)
47 B. Section 01 29 76 Progress Payment Procedures
48 C. Section 01 31 13 Project Coordination
49 D. Section 01 31 23 Project Management Web Site (PMWS)
50 E. Section 01 40 00 Quality Requirements
51 F. Section 01 77 00 Closeout Procedures
52 G. Section 01 78 13 Completion and Correction List
53 H. Section 01 91 00 Commissioning
54

1.3. PERFORMANCE REQUIREMENTS

- 56 A. All contractors shall be responsible for a proper quality assurance/quality control (QA/QC) program throughout
57 the execution of the Work defined within the construction documents, including all recognized construction
58 industry standards and all applicable regulatory codes.

- 1 B. The GC shall be responsible for all of the following:
 - 2 1. Monitor the quality of all workmanship, supplies, materials, and products being installed by all
 - 3 contractors and installers to ensure they meet or exceed the minimum requirements set forth by the
 - 4 construction documents.
 - 5 2. Submit a Request for Information (RFI) whenever manufacturers' instructions or referenced standards
 - 6 conflict with the construction documents before proceeding with the Work.
 - 7 3. Ensure that Work requiring special certifications or licensing is being performed by is being performed
 - 8 and supervised by personnel that meet the appropriate requirements.
 - 9 a. Ensure that all certificates and licenses are current throughout the execution of the project.
- 10 C. The CoM and its representatives shall perform quality assurance and quality control activities throughout the
- 11 execution of this project. This in no way relieves the GC of maintaining an acceptable QA/QC program. =
- 12

13 **1.4. QUALITY ASSURANCE**

- 14 A. The GC shall be responsible for the following:
 - 15 1. All materials, equipment, and products shall be new, clean, undamaged, and meet the performance
 - 16 specifications defined within the construction documents including favorably reviewed submittals.
 - 17 a. Any material, equipment, or product that does not meet the requirements of the construction
 - 18 documents shall be removed and replaced, including any adjacent and related work, at the GCs
 - 19 expense.
 - 20 2. All Work shall be performed by persons properly trained and/or qualified to produce workmanship of the
 - 21 quality specified in the construction documents.
 - 22 3. Providing access to updated as-builts, addenda, submittals, bulletins and other related construction
 - 23 documents at the project site.
- 24 B. The CoM and its representatives may be responsible for any of the following:
 - 25 1. Attend pre-installation meetings
 - 26 2. Attend construction progress meetings
 - 27 3. Review all submittals
 - 28 4. Conduct field visits for QA/QC purposes, provide feedback to the GC and sub-contractors using Quality
 - 29 Management Observation (QMO) reports.
 - 30 5. Review delivered equipment
 - 31 6. Witness equipment installations, startups, testing as specified in other specifications

32

33 **1.5. QUALITY MANAGEMENT OBSERVATION REPORT**

- 34 A. The Quality Management Observation report or QMO is used as a QA/QC tool by those entities responsible for
- 35 QA/QC activities, including but not limited to, the GC, CoM, Project Architect /Project Engineer(A/E PROJ MGR),
- 36 CX agent, etc.
- 37 B. QMOs are designed to be an early observation of non-conforming construction work before it becomes buried
- 38 by follow on work. As such it is most often used as an "in progress punch list".
- 39 C. QMO forms are part of the Quality Control Library on the Project Management Web Site.
- 40

41 **PART 2 – PRODUCTS - THIS SECTION NOT USED**

42

43 **PART 3 - EXECUTION**

44

45 **3.1. QUALITY MANAGEMENT RESPONSIBILITIES**

- 46 A. While making routine progress visits to the construction project the GC, CPM, CxA and A/E PROJ MGR, and
- 47 applicable others shall observe the details of the construction and installations to ensure that the intent of the
- 48 construction documents is being followed.
- 49 B. If during the progress visit there is a determination of contract non-conformance a QMO report shall be initiated
- 50 to begin the documentation process.
 - 51 1. The GC field superintendent shall be informed immediately of any issue that may cause harm, damage to
 - 52 finished work, or be buried prior to properly filing a QMO report.
- 53 C. The following information when filing a QMO report:
 - 54 1. Open a QMO report in the Project Management Web Site
 - 55 2. Enter the date and time of the field visit
 - 56 3. Provide references to construction documents if any (examples; specification, drawing page, details,
 - 57 approved submittals, RFI, CB, etc)
 - 58 4. Provide a short title for the observation being made

- 1 5. Provide a detailed description of the observation being made
- 2 6. Select all categories (Sitework, Structure, Enclosure, Interior, etc) from the given list that may apply to
- 3 the observation being reported.
- 4 a. For each category selected additional boxes shall open with contractor names associated with
- 5 each category.
- 6 7. Select all contractors from the lists provided that may need to be aware of the observation.
- 7 8. Provide any attachments that may help provide reference to the observation.
- 8 D. The software for the Project Management Website will email notifications that a QMO report has been initiated.
- 9

10 **3.2. RESPONDING TO A QMO**

- 11 A. The GC shall be responsible for determining the course of action required to remedy the non-conforming issue
- 12 and shall coordinate and direct the contractor(s) responsible for any work related to the observation.
- 13 B. All contractors assigned to remedy the observation by the GC shall provide follow-up responses
- 14 1. Open the QMO report in the Project Management Web Site.
- 15 2. Enter a description of your follow-up response in the box provided.
- 16 3. Add attachments (pictures) if needed to show the work has been completed.
- 17

18 **3.3. GENERAL CONTRACTORS FOLLOW-UP**

- 19 A. The GC shall inspect the work to ensure that all assigned contractors have remedied the observation to the
- 20 intent of the construction documents.
- 21 B. The GC shall respond with any additional comments in their response box.
- 22

23 **3.4. QMO CLOSEOUT PROCEDURE**

- 24 A. The person who initiated the QMO shall review the remedied work and if properly corrected shall close and date
- 25 the QMO form.
- 26 1. In the event there are still issues the Quality Manager can add additional comments in the response area,
- 27 and re-issue the QMO for additional review as needed.
- 28 B. Once the person who initiated the QMO has closed the item the CPM shall review and verify with the A/E PROJ
- 29 MGR that the Observation has been properly remedied and provide final closure on the QMO.
- 30

31 **3.5. CONSTRUCTION CLOSEOUT**

- 32 A. The GC shall note that successful close out QMOs are required for construction closeout as follows:
- 33 1. Certain progress payments as identified in Specification 01 29 76 are contingent QMO reports being
- 34 properly closed out.
- 35 2. Specification 01 77 00 defines all construction closeout requirements.
- 36
- 37
- 38
- 39
- 40

END OF SECTION

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SECTION 01 45 29
TESTING LABORATORY SERVICES

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PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

- 18 A. The Contractor shall employ and pay for the services of an independent testing laboratory to perform specified
19 services and testing.
20 B. Testing Laboratory inspection, sampling and testing is required for:
21 1. Section 03 30 00: Cast-In-Place Concrete
22 2. Section 05 12 00: Structural Steel Framing
23 3. Section 05 40 00: Cold-Formed Steel Framing
24 4. Section 31 20 00: Earthwork
25

1.2. RELATED REQUIREMENTS

- 27 A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or
28 approvals of public authorities.
29 B. Related Requirements Specified in Other Sections:
30 1. Division 22 and 23: Testing of Mechanical Systems
31 2. Division 26: Testing of Electrical Systems
32

1.3. QUALIFICATION OF LABORATORY

- 34 A. Meet “Recommended Requirements of Independent Laboratory Qualification” published by American Council of
35 Independent Laboratories.
36 B. Meet basic requirements of ASTM E 329, “Standards of Recommended Practice for Inspection and Testing
37 Agencies for Concrete and Steel as Used in Construction.”
38 C. Authorized to operate in State in which the Project is located.
39

1.4. LABORATORY DUTIES

- 41 A. Cooperate with Owner, A/E and Contractor; provide qualified personnel after due notice.
42 B. Perform specified inspections, sampling and testing of materials and methods of construction:
43 1. Comply with specified standards.
44 2. Ascertain compliance of materials with requirements of Contract Documents.
45 C. Promptly notify the Owner, A/E and Contractor of observed irregularities or deficiencies of work or products.
46 D. Promptly submit written report of each test and inspection; one copy each to A/E, Consulting Engineer, Owner
47 and Contractor. Each report shall include:
48 1. Date issued.
49 2. Project Title and number.
50 3. Testing laboratory name, address and telephone number.
51 4. Name and signature of laboratory inspector.
52 5. Date and time of sampling or inspection.
53 6. Record of temperature and weather conditions.
54 7. Date of test.
55 8. Identification of product and specification section.
56 9. Location of sample or test in the Project.
57 10. Type of inspection or test.
58 11. Results of tests and compliance with Contract Documents.

- 1 12. Interpretation of test results, when requested by A/E or the Contractor.
2 E. Perform additional tests as required by Owner, A/E or the Contractor.
3
4 **1.5. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY**
5 A. Laboratory is not authorized to:
6 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
7 2. Approve or accept any portions of the Work other than those portions of the Work scheduled for testing.
8 3. Perform any duties of the Contractor.
9
10 **1.6. CONTRACTOR'S RESPONSIBILITIES**
11 A. Cooperate with laboratory personnel, provide access to Work and to manufacturer's operations.
12 B. Secure and deliver to the laboratory, adequate quantities of representative samples of materials proposed to be
13 used and which require testing. Submit concrete mix designs to A/E for approval prior to pouring concrete.
14 C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes
15 that require control by the testing laboratory.
16 D. Furnish copies of Product test reports as required.
17 E. Furnish incidental labor and facilities:
18 1. To provide access to Work to be tested.
19 2. To obtain and handle samples at the Project site or at the source of the product to be tested.
20 3. To facilitate inspections and tests.
21 4. For storage and curing of test samples.
22 F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and
23 scheduling of tests.
24 G. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's
25 convenience.
26 H. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform
27 additional inspections, sampling and testing required when initial tests indicate work does not comply with
28 Contract Documents.
29 I. Temporarily halt the progress of the Work when tested materials do not comply with Contract Documents and
30 promptly notify the Owner or their designated representative and A/E.
31 J. Remove and replace at no cost to the Owner, all defective materials discovered upon testing not to comply with
32 Contract Documents, including cost for retesting and re-inspecting replaced Work that failed to comply with the
33 Contract Documents.
34
35 **1.7. SPECIFIC TEST, INSPECTIONS, AND METHODS REQUIRED**
36 A. **Section 03 30 00: Cast-In-Place Concrete**
37 1. Secure sample of aggregates Contractor proposes to use and test for compliance with Specifications.
38 2. Certify compliance with Specifications of cement proposed for use by the Contractor.
39 3. Review and approve the Contractor's proposed concrete mix proportions for the required concrete
40 strengths using materials Contractor proposed to use on the project. Incorporate specified admixtures
41 and not less than amounts of cement specified.
42 4. Perform appropriate laboratory tests, including compression tests of cylinders and slump test to
43 substantiate mix designs.
44 5. Inspect and test materials during concrete work to substantiate compliance with Specifications and mix
45 requirements.
46 a. Testing:
47 i. Sample and test concrete in accordance with ASTM C 31, ASTM C 143, ASTM C 172, and
48 ASTM C 231.
49 ii. Perform slump tests in accord with ASTM C 143 from same concrete batch used for test
50 cylinders and record results and comments on compression test reports.
51 iii. Perform compression tests in accordance with ASTM C39.
52 iv. When air-entrained concrete is used, a minimum of one (1) air content test shall be
53 performed in accordance with ASTM C 231 for each set of test cylinders taken.
54 v. Identify all test cylinders with symbols to indicate location on the job where concrete test
55 was made. Record on project record drawings.
56 vi. Strength tests shall be made for: each day's pour; each class of concrete; each change of
57 supplies or sources; and for each 100 cubic yards of concrete or fraction thereof.

- vii. One slump test shall be made for each set of test cylinders taken following the procedure in ASTM C 143.
 - b. Test Cylinders for all Concrete
 - i. Each test shall consist of a minimum of four cylinders.
 - ii. Make test cylinders in conformity with ASTM C 31.
 - iii. After 24 hours three cylinders to be carefully transported to the testing laboratory for moisture curing and one cylinder to be field cured.
 - iv. One field cured cylinder to be tested at 7 days and two laboratory cured cylinders to be tested at 28 days. Reserve one cylinder for further testing.
 - v. The average of all strength tests representing each class of concrete, as well as the average of any three consecutive strength tests for each class of concrete, shall be equal to or greater than the specified strength.
 - vi. If the A/E has reason to believe that cylinder strength tests are not representative of the strength of concrete in place, A/E shall require drilled cores to be cut and tested at the Contractor’s expense. Coring and testing shall be in accordance with ASTM C 42 Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - B. **Section 05 12 00: Structural Steel Framing**
 - 1. Welding:
 - a. Provide inspection of shop and field welding in accordance with Section 6 of AWS D1.1.
 - b. Visually inspect all welds, perform appropriate non-destructive tests on apparent defective welds. Verify conformance with Specifications.
 - c. Non-destructive testing shall be performed on 20 percent of the total length of all full penetration welds. If a sufficient number of welds are deficient, additional testing may be performed at the discretion of the testing lab, at no cost to Owner.
 - 2. Bolting:
 - a. Visually inspect all connections for proper number, size and type of bolt.
 - b. Review all bolted connections for compliance with “snug tight” requirements of AISC.
 - c. No Slip-critical (SC) connections/bolts are required for this project.
 - d. Shear Connectors, Headed/Deformed Bar Concrete Anchors:
 - i. Verify pre-production test records for installation of shear connectors, concrete anchors and threaded studs.
 - ii. Shear connectors shall be struck with a hammer. Those not producing a “clean” pinging sound indicative of a fully attached shear connector shall be bent 15 degrees off vertical towards the nearest support by striking with a hammer. If shear connector does not become loose and weld is not broken, it shall be considered acceptable, and shall be left in the bent position. Replace failing shear connectors and test as before.
 - iii. A visual inspection shall be made of shear connectors and headed/deformed bar concrete anchors after installation. If visual inspection reveals that a sound weld and a 360 degree flash has not been obtained, the connector/anchor shall also be tested by bending a minimum of 15 degrees off vertical opposite to the missing weld/flash, irrespective of the results of the “ping” test required for shear connectors. If the connector/anchor does not become loose it shall be considered acceptable and shall be left in this position. Replace failing connector/anchors and inspect as before.
 - C. **Section 05 40 00: Cold Formed Steel Framing**
 - 1. As directed by A/E, Contractor’s testing agency may inspect the maintenance of a quality control program including spot checking weldments and welding procedures in accordance with AWS standards.
 - D. **Section 31 20 00: Soil Compaction Control and Trenching and Backfilling**
 - 1. Soils Engineer to be onsite during excavation operation.
 - 2. Visually inspect, test, and certify that exposed undisturbed underlying soil is suitable for required footing bearing capacity and placement of fills.
 - 3. Maximum and minimum density of fill soil for compaction percentage of relative density and moisture density shall be determined in accordance with ASTM Designation D 1557. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.
 - 4. Number of tests as follows:
 - a. Subgrade, Undisturbed and Demolition Surfaces: Visual inspection and probe; test if required.
 - b. Interior Fills: One test per 2,500 sq. ft for each two foot or less lift.
 - c. Exterior Fills: One test per 2,500 sq. ft for each two foot or less lift.

1 d. Utility Trenches: One test per 50 lineal feet for each two foot or less lift.

2

3 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

4

5

6 **PART 3 – EXECUTION – THIS SECTION NOT USED**

7

8

9

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

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27

PART 1 – GENERAL

1.1. SUMMARY

- A. This Section includes general procedural requirements for temporary facilities and controls including, but not limited to the following:
1. Temporary Utilities
 2. Telecommunications Services
 3. Temporary Sanitary Facilities
 4. Barriers
 5. Fencing
 6. Exterior Enclosures
 7. Security
 8. Vehicular Access and Parking
 6. Waste Removal
 7. Project Identification
 8. Field Offices

1.2. RELATED SPECIFICATION SECTIONS

- A. Section 01 31 19 Progress Meetings
B. Section 01 31 23 Project Management Web Site
C. Section 01 74 19 Construction Waste Management and Disposal

1.3. QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
1. Building Code requirements
 2. Health and safety regulations
 3. Utility company regulations
 4. Police, Fire Department and Rescue Squad rules
 5. Environmental protection regulations
 6. Joint Commission - Hospital Accreditation Standards

- 1 B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition
- 2 Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA
- 3 Electrical Design Library "Temporary Electrical Facilities".
- 4 C. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service.
- 5 Install service in compliance with NFPA 70 "National Electric Code".
- 6

7 **1.4. TEMPORARY UTILITIES**

- 8 A. Contractor will provide the following:
 - 9 1. Electrical power
 - 10 2. Water supply
- 11 B. Electric Service: No Existing facilities are present
- 12 C. Water Service: No Existing facilities are present
 - 13 1. Use trigger-operated nozzles for water hoses, to avoid waste of water.
- 14 D. Temporary Electric Power Service: Responsibility of Contractor
- 15 E. Temporary Lighting: Contractor shall provide temporary lighting
 - 16 1. Install and operate temporary lighting, minimum of 30 fc, to fulfill security and protection requirements,
 - 17 without operating the entire system, and will provide adequate illumination for all areas of work,
 - 18 including construction operations and traffic conditions.
- 19 F. Temporary Heat: Contractor shall provide temporary heat required by construction activities, for curing or drying
- 20 of completed installations or protection of installed construction from adverse effects of low temperatures or
- 21 high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements
- 22 being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize
- 23 consumption of energy.
 - 24 1. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-
 - 25 contained LP gas or fuel oil heaters with individual space thermostatic control.
 - 26 a. Use of gasoline-burning space heaters, open flame, or salamander type heating units is
 - 27 prohibited.
 - 28

29 **1.5. TELECOMMUNICATIONS SERVICES AND WI-FI**

- 30 A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization through
- 31 construction closeout.
- 32 B. Telecommunications services shall include:
 - 33 1. Windows-based personal computer dedicated to project telecommunications.
 - 34 2. Shared access to the internet via WIFI or similar wireless connection.
 - 35 a. Access must be capable to support minimum of <10> wireless devices.
 - 36 3. Email Account/address dedicated for GC Project Manager of GC Supervisor on site.
 - 37

38 **1.6. TEMPORARY SANITARY FACILITIES**

- 39 A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- 40 B. Temporary toilets: Comply with regulations and health codes for the type, number, location, operation, and
- 41 maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - 42 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide
 - 43 covered waste containers for used material.
 - 44 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
- 45 C. Maintain daily in clean and sanitary condition
- 46 D. Water: Provide potable water approved by local health authorities
- 47

48 **1.7. BARRIERS**

- 49 A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be
- 50 hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from
- 51 construction operations and demolition.
- 52

53 **1.8. FENCING**

- 54 A. Construction: Refer to Plan Documents and Specification Section 01 76 00: Fencing Materials and Barricades
- 55

56 **1.9. EXTERIOR ENCLOSURES**

- 57 A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions
- 58 and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures

1 identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors
2 with self-closing hardware and locks.
3

4 **1.10. SECURITY**

- 5 A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized
6 entry, vandalism, or theft.
7

8 **1.11. VEHICULAR ACCESS AND PARKING**

- 9 A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for
10 emergency vehicles.
11 B. Coordinate access and haul routes with governing authorities and Owner.
12 C. Provide and maintain access to fire hydrants, free of obstructions.
13 D. All parking should be onsite and within the extents of construction. Street Parking as signed is available.
14

15 **1.12. WASTE REMOVAL**

- 16 A. See Section 01 74 19 - Waste Management, for additional requirements.
17 B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
18 C. Provide containers with lids. Remove trash from site periodically.
19 D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible
20 containers; locate containers holding flammable material outside the structure unless otherwise approved by the
21 authorities having jurisdiction.
22 E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.
23

24 **1.13. PROJECT IDENTIFICATION**

- 25 A. Provide project identification sign of design and construction indicated in Section 01 58 13.
26 B. Erect on site at location determined by Owner .
27 C. No other signs are allowed without Owner permission except those required by law.
28

29 **1.14. FIELD OFFICES**

- 30 A. Office: Weather tight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy
31 furniture, drawing rack and drawing display table.
32 B. Field Office shall be located within the construction limits or as approved by City Construction Manager.
33 C. Provide space for Project Meetings with table and chairs to accommodate a minimum of <fifteen (15)> persons.
34 D. Provide a minimum of a 40" LCD monitor or other digital projection device to be connected to the computer
35 identified in Section 1.4 Telecommunications Services (above), for use during progress meetings in connection
36 with reviewing construction progress information posted to the Project Management Web Site (Specification 01
37 31 23) hosted by the Owner.
38

39 **PART 2 - PRODUCTS**

40
41 **2.1. TEMPORARY PARTITIONS**

- 42 A. Provide dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and
43 noise.
44 1. Non-fire rated partitions, standard
45 a. Wood stud framing, 6-mil polyethylene
46

47 **2.2. EQUIPMENT**

- 48 A. Temporary Lifts and Hoists: Contractors requiring temporary lifts and hoists shall provide facilities for hoisting
49 materials and employees.
50 B. Electrical Outlets: Electrical Contractor shall provide properly configured NEMA polarized outlets to prevent
51 insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault
52 circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
53 C. Electrical Power Cords: Contractors requiring power cords shall provide grounded extension cords; use "hard-
54 service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate
55 lengths of electric cords, if single lengths will not reach areas where construction activities are in progress. Do
56 not exceed safe length-voltage ratio.

- 1 D. Lamps and Light Fixtures: Electrical Contractor shall provide general service incandescent lamps of wattage
- 2 required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to
- 3 breakage. Provide exterior fixtures where exposed to moisture.
- 4 E. Heating Units: General Contractor shall provide temporary heating units that have been tested and labeled by
- 5 UL, FM or another recognized trade association related to the type of fuel being consumed.
- 6 F. First Aid Supplies: General Contractor shall provide first aid supplies complying with governing regulations.
- 7 G. Fire Extinguishers: General Contractor shall provide hand-carried, portable UL-rated, fire extinguishers of NFPA
- 8 recommended classes for the exposures, extinguishing agent and size required by location and class of fire
- 9 exposure.

10
11 **PART 3 - EXECUTION**

12
13 **3.1. TEMPORARY FIRE PROTECTION**

- 14 A. Until fire protection needs are supplied by permanent facilities, General Contractor shall install and maintain
- 15 temporary fire protection facilities of the types needed to protect against reasonably predictable and
- 16 controllable fire losses.
- 17 B. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding
- 18 Construction, Alterations and Demolition Operations".
- 19 C. Locate fire extinguishers where convenient and effective for their intended purpose.
- 20 D. Store combustible materials in containers in fire-safe locations.
- 21 E. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways
- 22 and other access routes for fighting fires.
- 23 F. Prohibit smoking on the premises.
- 24 G. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition
- 25 according to requirements of authorities having jurisdiction.
- 26 H. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site
- 27 I. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods
- 28 and procedures. Post warnings and information.

29
30 **3.2. COLLECTION AND DISPOSAL OF WASTE**

- 31 A. Collect waste from construction areas and elsewhere daily
- 32 B. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce
- 33 requirements strictly.
- 34 C. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to
- 35 rise above 80 deg F.
- 36 D. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing
- 37 properly. Dispose of material in a lawful manner.

38
39 **3.3. ENVIRONMENTAL PROTECTION**

- 40 A. Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply
- 41 with environmental regulations, and minimize the possibility that air, waterways and subsoil might be
- 42 contaminated or polluted, or that other undesirable effects might result.
- 43 B. Avoid use of tools and equipment which produce harmful noise.
- 44 C. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms
- 45 near the site.

46
47 **3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS**

- 48 A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.
- 49 B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- 50 C. Clean and repair damage caused by installation or use of temporary work.
- 51 D. Restore existing facilities used during construction to original condition.
- 52 E. Restore new permanent facilities used during construction to specified condition.

53
54
55
56 **END OF SECTION**

**SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE**

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PART 1 – GENERAL

1.1. SECTION INCLUDES

- A. Project identification sign.

1.2. QUALITY ASSURANCE

- A. Design sign and structure to withstand 50 miles/hr wind velocity.
B. Sign Painter: Experienced as a professional sign painter for minimum three years.
C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.3. SUBMITTALS

- A. See Section 01 30 00 – Administrative Requirements for submittal procedures.
B. Shop Drawing: Show content, layout, lettering, color, structure, sizes.

PART 2 - PRODUCTS

2.1. SIGN MATERIALS

- A. Structure and Framing: New, wood, structurally adequate.
B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4" thick, standard large sizes to minimize joints.
C. Rough Hardware: Galvanized

2.2. PROJECT IDENTIFICATION SIGN

- A. One painted sign, 32 sq ft area, bottom 6 feet above ground.
B. Content:
1. Project title, City of Madison, Community Development Division logo and name of Owner as indicated on Contract Documents.
2. Names and title of Architect.
3. Name of Prime Contractor.
4. Full color project rendering from high resolution image as furnished by Architect.

PART 3 - EXECUTION

3.1. INSTALLATION

- A. Install project identification sign within 30 days after date fixed by Notice to Proceed.
B. Erect at designated location.
C. Install sign surface plumb and level, with butt joints. Anchor securely.

3.2. REMOVAL

- A. Remove sign, framing supports, and foundations at completion of Project and restore the area.

END OF SECTION

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**SECTION 01 60 00
PRODUCT REQUIREMENTS**

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PART 1 – GENERAL

1.1. SUMMARY

- 22 A. The purpose of this specification is to provide general guidelines and responsibilities related to the receiving,
23 handling, and storage of all materials and products from arrival on the job site through installation.
24 1. Immediate inspection of delivered goods means a timely replacement if damaged.
25 2. Proper storage helps prevent damage and loss by weather, vandalism, theft, and job site accidents.
26 3. Proper storage helps with job site performance and safety.
27 2. Proper handling helps prevent damage and job site accidents.
28 B. Each Contractor shall be directly responsible for the receiving, handling, and storage of all materials and
29 products associated with the Work of their Division or Trade.
30 C. Each Contractor responsible for Work associated with Owner provided materials or products shall be responsible
31 for the receiving, handling and storage of the material/product as outlined in Section 3.8 below..
32

1.2. RELATED SPECIFICATIONS

- 34 A. Parts of this specification will reference articles within “The City of Madison FACILITIES MANAGEMENT
35 SPECIFICATIONS for Public Works Construction”.
36 1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONS web page:
37 <http://www.cityofmadison.com/business/pw/specs.cfm>
38 a. Click on the “Part” chapter identified in the specification text. For example if the specification
39 says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2” click the link for
40 Part II, the Part II PDF will open.
41 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
42 to the referenced text.
43 c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.
44 B. Section 01 57 21 Indoor Air Quality
45 C. Section 01 74 13 Progress Cleaning
46 D. Section 01 76 00 Protecting Installed Construction
47 E. Other Divisions and Specifications that may address more specifically the requirements for the storage and
48 handling of materials and products associated Work of other Divisions or Trades.
49

1.3. QUALITY ASSURANCE

- 51 A. The GC shall be responsible for ensuring that these minimum storage and handling requirements are met by all
52 contractors on the project site including but not limited to the following:
53 1. Receiving deliveries of materials, products, and equipment.
54 a. Inspect all deliveries upon arrival for damage, completeness, and compliance with the
55 construction documents.
56 i. Deliveries shall remain in original packaging or crates, shipping manifest shall be kept with
57 the delivery and the packaging shall have visible identification of the items within the
58 packaging.

- 1 b. Immediately report any damaged products or equipment to the GC, begin arrangements for
2 immediate replacement.
- 3 c. Materials or equipment that have been damaged, are incomplete, or do not comply with the
4 construction documents shall not be permitted to be installed.
- 5 2. All materials and products shall be stored within the designated limits of the project site. Only store the
6 amount of material necessary for upcoming operations so as not to interfere with other construction
7 activities and access to Work by the Owner and Architect. Any offsite storage shall be at the expense of
8 the contractor storing the material or product. All offsite storage requirements shall comply with this
9 specification. All offsite storage of materials is subject to Owner Representative Quality Management
10 review at any time.
- 11 3. Large storage containers may be used but shall be weather tight, securable, placed on concrete blocks,
12 timbers, or jack stands and shall be level.
- 13 4. When lifting equipment is required the equipment rating shall be greater than the loading requirements
14 of the item being lifted. In addition all of the following shall apply as necessary:
15 a. Only designated and/or designed lift points shall be used.
16 b. Large items shall have tag lines and handlers at all times during lifting operations.
17 c. Lift at multiple points as needed to prevent bending.
- 18 5. Materials and products stored inside of the structure shall comply with all of the following:
19 a. Storage shall not be allowed to impede the flow of work in progress.
20 b. Storage shall not be allowed to hide completed work from review and inspections.
21 c. Storage shall not exceed the design loads of the structural components it is being stored upon.
- 22 6. All materials and products shall be stored according the manufacturers minimum recommended
23 requirements. All of the following shall be considered before storing any product or material:
24 a. Dust and dirt
25 b. Moisture and humidity, including rain and snow
26 c. Excessive temperatures, direct sun, etc
27 d. Product or material weight and size
28 e. Potential for breakage
29 f. Product incompatibility with other products such as corrosiveness, chemical reactions,
30 flammability, etc.
31 g. Product or material value and replacement cost
- 32 7. The Contractor shall be responsible for providing fully functional tarps or plastic wrap, to protect
33 materials and products from the weather. All coverings shall be free of large holes and tears, and shall be
34 tied, strapped, or weighted down to resist blowing.
- 35 8. The Contractor shall be responsible for any temporary heating, cooling, or other utility requirement that
36 may be associated with the storage of a material or product.
- 37 9. The Contractor shall be responsible for securing materials and products of value such as copper, A/V
38 equipment, etc. Such items shall be stored in securable shipping containers, job trailers or other such
39 storage devices. Container shall be kept secured when not in use.
- 40 B. The GC shall inspect the job site daily to ensure that all products and materials stay weather tight and are
41 secured against vandalism or theft as required by this specification.
- 42 C. The Owners Representative may at any time request improvements regarding storage of any material or product
43 being provided under these construction documents.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR REQUIREMENTS

- 50 A. Designate material storage and handling areas as needed including all of the following:
51 1. Designate specific areas of the site for delivery and storage of materials to be used during the execution
52 of the Work.
53 2. Designated areas shall not be located so as to interfere with the installation of any Work including Work
54 by others such as the installation of utilities or the maintenance of existing utilities. This shall include not
55 storing items in active utility easements as designated by the site plan.
- 56 B. Arrange for openings in the building as needed to allow delivery and installation of large items. Openings shall
57 be appropriately sized to include the use of booms, slings, and other such lifting devices that may be larger than
58 the item being installed.

- 1 1. When openings are required in completed Work (new or existing) the GC shall be responsible for
2 providing an appropriate opening and for restoring the opening to the original or better condition upon
3 completion. Restoration shall be weather tight and complete.
4 C. Repeated moving and handling of items being stored shall not be allowed. The GC shall be responsible for any
5 damage and replacement because of mishandling or excessive handling.
6
7 **3.2. BULK MATERIAL**
8 A. Bulk material such as sand, gravel, top soil and other types of fill shall be stored away from the construction area
9 and shall be stock piled as follows:
10 1. All bulk material shall be piled safely and efficiently in as small an area as practical. Only store the
11 amount of material necessary for upcoming operations so as not to interfere with other construction
12 activities and access to Work by the Owner and Architect.
13 2. All stock piles shall have silt fence/sock properly installed around the perimeter to prevent erosion and
14 loss of material. Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION Section 210.1(f) and
15 other related specification or details.
16 3. Fine grained material shall be protected with tarps to prevent blowing. Tarps shall be weighted or staked
17 to stay in place.
18 B. Bulk material such as brick, concrete block, stone, and other palletized materials shall be stored on original
19 shipping pallets until ready for use.
20
21 **3.3. DRY PACKAGED MATERIAL**
22 A. Dry packaged material such as cement, mortar, etc shall be stored on pallets, on slightly elevated ground or clear
23 stone pad to keep water away from the base of the material being stored. Protect from moisture.
24
25 **3.4. STRUCTURAL AND FRAMING MATERIAL**
26 A. All structural and framing material shall be stored in an organized manner arranged by type, size and dimension.
27 Materials shall be stored on pallets or timbers as necessary and shall not be allowed to lie directly on the ground.
28 B. Long and heavy items shall be supported at several points to prevent bending and warping.
29
30 **3.5. EQUIPMENT**
31 A. Equipment delivered to the site shall be stored away from all construction activities until the item can either be
32 moved inside or properly installed.
33 B. Equipment shall be stored on slightly elevated ground or clear stone pad to keep water away from the base of
34 the equipment.
35
36 **3.6. FINISH PRODUCTS**
37 A. Finish products such as flooring, tile, counters, lockers, toilets, partitions, lighting, and other similar items should
38 not be delivered and stored until the structure has been enclosed, is weather tight, temperature controlled and
39 the contractor is ready for such items to be installed.
40 1. Storage of finished products outside for any length of time shall not be allowed.
41 B. Products that cannot be stored inside the structure shall be stored in secured containers or job trailers until such
42 time as they are ready to be installed.
43 C. Products with a high potential for breakage such as glass, mirrors, tiles, toilet fixtures, etc. shall be stored with
44 additional protection as necessary such as but not limited to the following:
45 1. Store in original shipping containers until ready for installation.
46 2. Do not store in high traffic areas.
47 3. Shield with other materials such as cardboard, plywood, or similar products.
48
49 **3.7. DUCTWORK, PIPING, AND CONDUIT**
50 A. All piping and conduit shall be stored horizontally unless otherwise specified by the manufacturer or Division and
51 Trade Specifications.
52 1. Do not store directly on grade.
53 2. Cover metal pipes and tubes to prevent rust and corrosion, allow ventilation to prevent condensation.
54 3. Whenever possible use pipe stands for storing pipe and conduit to prevent tripping and rolling hazards.
55 B. All ductwork shall be stored horizontally or vertically as necessary unless otherwise specified by the
56 manufacturer or Division and Trade Specifications.
57 1. During storage, both ends of each duct shall be protected with plastic sheathing to prevent dust and dirt
58 from getting inside the duct. Sheathing shall be sufficiently taped to the duct.

- 2. After installation, free/open ends shall remain protected with taped plastic sheathing and or temporary filters as specified by division or Trade specifications.

3.8. OWNER PROVIDED, CONTRACTOR INSTALLED EQUIPMENT

- A. Section 3.8.A. shall apply to all equipment being provided to any contractor directly from the Owner for installation under the contract.
 - 1. The Owner or Owners Representative shall do the following:
 - a. Inspect all deliveries upon receipt and notify manufacturer of any issues directly.
 - b. Review the received shipment with the contractor.
 - i. Only provide products or materials to the contractor that were not damaged through shipping or handling.
 - ii. Confirm missing products or materials and anticipated delivery schedule if known.
 - 2. The Contractor responsible for the installation of Work associated with Owner provided materials or products shall “take ownership” and provide safe and secure storage and handling as previously described within this specification.
 - i. The Contractor shall be liable for the repair or replacement of any material or product damaged after taking ownership of the product from receipt through final acceptance.
- B. Section 3.8.B. shall apply to all equipment being provided by the Owner but shipped directly to any sub-contractor or the project site for installation under the contract.
 - 1. The GC and/or Contractor responsible for the Work associated with the Owner provided materials or products shall do the following:
 - a. Inspect all deliveries upon receipt and notify the Owner or Owners Representative of any issues directly.
 - i. Owner or Owners Representative shall notify manufacturer of any issues directly.
 - b. Review the received shipment with the Owner or Owners Representative
 - i. Confirm missing products or materials and anticipated delivery schedule if known.
 - 2. The Contractor shall “take ownership” and provide safe and secure storage and handling as previously described within this specification.
 - i. The Contractor shall be liable for the repair or replacement of any material or product damaged after taking ownership of the product from receipt through final acceptance.

END OF SECTION

**SECTION 01 71 23
FIELD ENGINEERING**

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12

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

- A. The Contractor shall provide and pay for field engineering services required for the Project:
1. Land surveying services required to execute the Work, to include building addition location and layout, and location and layout of pavements and all proposed site improvements.
 2. Verification of existing building dimensions, elevations, and relationship to proposed additions.
 3. Professional Engineering services to execute Contractor’s construction methods.
 4. Registered Professional Engineer in the State of Wisconsin to determine the load capacity of the existing structure for use of Contractors temporary facilities, equipment, lifts, machinery, material storage, etc.

1.2. RELATED REQUIREMENTS

- A. Conditions of the Contract

1.3. PROCEDURES

- A. A property survey has been prepared for the Owner and has been bound with Contract Drawings. Surveys shall describe physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. If information is incomplete, notify Owner to furnish additional information. Verify easement locations, front, side, and rear yard restrictions, if any; and property line locations. Verify control points, and establish bench marks. Locate and layout roads, walks, parking areas and all civil structures and all proposed site improvements.
- B. Verify locations of underground services, utilities, structures, etc. which may be encountered or affected by the Work.

1.4. PROJECT SURVEY REQUIREMENTS

- A. Using datum, the lot lines and present levels have been established as indicated on the Drawings. Other grades, lines, levels and benchmarks, shall be established and maintained by the Contractor, who shall be responsible for them. As work progresses, the Contractor shall layout on forms and floor, the locations of all partitions, walls and fix column centerlines as a guide to all trades. The Contractor shall make provision to preserve property line stakes, benchmarks, or datum point. If any are lost, displaced or disturbed through neglect of any Contractor, Contractor’s agents or employee, the Contractor responsible shall pay the cost of restoration.
- B. Establish lines and levels, locate and layout, by instrumentation and similar appropriate means, additions, column locations, floor levels, stakes for walks, etc.
- C. Provide data to all Subcontractors for their use as applicable.
- D. From time to time, verify layouts by same methods.

1.5. RECORDS

- A. Maintain a complete, accurate log of all control and survey work as it progresses.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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**SECTION 01 73 29
CUTTING AND PATCHING**

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. This Section includes general procedural requirements for cutting and patching including, but not limited to the
22 following:
23 1. Examination
24 2. Preparation
25 3. Performance
26 4. Cleanup and Restoration
27

1.2. RELATED SPECIFICATION SECTIONS

- 29 A. Divisions 02 through 32 Sections for specific requirements and limitations applicable to cutting and patching
30 individual parts of the Work.
31 B. Division 07 Section "Penetration Fire Stopping" for patching fire-rated construction.
32

1.3. DEFINITIONS

- 34 A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
35 B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other
36 Work.
37 C. Level Alpha
38

1.4. QUALITY ASSURANCE

- 40 A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying
41 capacity or load-deflection ratio.
42 B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results
43 in reducing their capacity to perform as intended or that may result in increased maintenance or decreased
44 operational life or safety.
45 C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that
46 could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that
47 may result in increased maintenance or decreased operational life or safety. Some miscellaneous elements
48 include the following:
49 1. Water, moisture, or vapor barriers
50 2. Membranes and flashings
51 3. Exterior curtain-wall construction
52 4. Equipment supports
53 5. Piping, ductwork, vessels, and equipment
54 6. Noise and vibration control elements and systems
55 D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and
56 patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that
57 would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has
58 been cut and patched in a visually unsatisfactory manner.

1 **1.5. WARRANTY**

- 2 A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting
3 and patching operations, by methods and with materials so as not to void existing warranties.
4 B. All cutting and patching work performed under this contract shall be warranted like new work as defined by the
5 Specification governing the work.
6

7 **PART 2 - MATERIALS**

8
9 **2.1. GENERAL**

- 10 A. Comply with requirements specified within other sections of the Specifications.
11 B. In-Place Materials: Use materials identical to existing in-place materials. For exposed surfaces use materials that
12 visually match in-place adjacent surfaces to the fullest extent possible.
13 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the
14 visual and functional performance of in-place materials.
15

16 **PART 3 - EXECUTION**

17
18 **3.1. EXAMINATION**

- 19 A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
20 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including
21 compatibility with in-place finishes or primers.
22 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
23

24 **3.2. PREPARATION**

- 25 A. Temporary Support: Provide temporary support of Work to be cut.
26 B. Protection: Protect in-place construction and existing conditions during cutting and patching to prevent damage.
27 Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting
28 and patching operations. If the failure to protect, or the lack of protection, of in-place construction and/or
29 existing conditions results in damage, the contractor shall be responsible for repair to previous condition.
30 C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
31 D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be
32 removed, relocated, or abandoned, bypass such services/systems before cutting to eliminate interruption to
33 occupied areas.
34

35 **3.3. PERFORMANCE**

- 36 A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the
37 earliest feasible time, and complete without delay.
38 1. Cut in-place construction to provide for installation of other components or performance of other
39 construction, and subsequently patch as required to restore surfaces to their original condition.
40 B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations,
41 including excavation, using methods least likely to damage elements retained or adjoining construction. If
42 possible, review proposed procedures with original Installer; comply with original Installer's written
43 recommendations.
44 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and
45 chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance
46 of adjacent surfaces. Temporarily cover openings when not in use.
47 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
48 3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
49 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by
50 cutting and patching operations.
51 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap,
52 valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other
53 foreign matter after cutting.
54 6. Proceed with patching after construction operations requiring cutting are complete.
55 C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following
56 performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and
57 comply with installation requirements specified in other Sections.

1 D. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of
2 installation.
3

4 **3.4. CLEANUP AND RESTORATION**

- 5 A. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a
6 manner that will eliminate evidence of patching and refinishing.
- 7 1. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - 8 2. Restore damaged pipe covering to its original condition.
 - 9 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another,
10 patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish,
11 color, texture, and appearance. Remove in-place floor and wall coverings and replace with new
12 materials, if necessary, to achieve uniform color and appearance.
 - 13 4. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch
14 and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats
15 until patch blends with adjacent surfaces.
 - 16 5. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of
17 uniform appearance.
 - 18 6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight
19 condition.
 - 20 7. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint,
21 mortar, oils, putty, and similar materials.
 - 22 8. Any smoke and fire caulking that has been disturbed must be replaced by the Contractor as required by
23 code.
24
25
26
27
28

END OF SECTION

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**SECTION 01 74 13
PROGRESS CLEANING**

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16

PART 1 – GENERAL

1.1. SUMMARY

- 20 A. Throughout the execution of this contract all contractors shall be responsible for maintaining the project site in a
21 standard of cleanliness as described in this specification.
22 B. All contractors shall also comply with the requirements for cleaning as described in other specifications.
23 C. Work included in this specification shall include but not be limited to:
24 1. Safety Cleaning
25 2. Project Site Cleaning
26 3. Progress Cleaning
27 4. Final Cleaning
28

1.2. RELATED SPECIFICAITONS

- 30 A. Section 01 35 00 Special Procedures
31 B. Section 01 60 00 Product Requirements
32 C. Section 01 74 19 Construction Waste Management and Disposal
33 D. Section 01 76 00 Protecting Installed Construction
34

1.3. QUALITY ASSURANCE

- 36 A. The General Contractor (GC) shall conduct daily inspections, more often if necessary, of the entire project site to
37 ensure the requirements of cleanliness are being met as described within these specifications.
38 B. All contractors shall comply with other regulatory requirements as they apply to waste recycling, reuse, hauling,
39 and disposal requirements of any governmental authority having jurisdiction.
40 C. The Owner reserves the right to have work done by others in the event any contractor fails to perform cleaning
41 as described within these specifications. The cost of any Owner provided cleaning shall be charged to the
42 contractor through a deduct change order.
43

PART 2 - PRODUCTS

2.1. CLEANING MATERIALS AND EQUIPMENT

- 47 A. The Contractor shall provide all required personnel, equipment, and materials necessary to maintain the
48 required level of cleanliness as described in this specification.
49 B. Use only cleaning materials and equipment that are compatible with the surface being cleaned, as
50 recommended by the manufacturer, or as approved by the A/E.
51 C. Use only cleaning materials, equipment, and methods as recommended in the manufacturers care and use guide
52 of the material, finish or equipment being cleaned.
53

PART 3 - EXECUTION

3.1. SAFETY CLEANING

- 57 A. All Contractors shall be responsible for safety cleaning as required by OSHA and other regulatory requirements
58 as applicable.

- 1 B. Safety Cleaning shall include but not be limited to the following:
 - 2 1. All work areas, passageways, ramps, and stairs shall be kept free of debris, scrap materials, pallets, and
 - 3 other large items that would obstruct exiting routes. Small items such as tools, electrical cords, etc are
 - 4 picked up when not in use.
 - 5 2. Form and scrap lumber shall have nails/screws removed or bent over. Lumber shall be neatly stacked in
 - 6 an area designated by the GC.
 - 7 3. Spills of oil, grease, and other such liquids shall be cleaned immediately or sprinkled with sand/oil-dry
 - 8 first, then cleaned.
 - 9 4. Oily, flammable, or hazardous items shall be stored in appropriate covered containers and storage
 - 10 devices unless actively being used.
 - 11 5. Oily, or flammable rags, and other such waste shall only be disposed of in authorized covered containers.
 - 12 6. Disposal by burning shall not be allowed at any time.

13
14 **3.2. PROJECT SITE CLEANING**

- 15 A. This section applies to the general cleanliness of the project site as a whole for the duration of the execution of
- 16 this contract.
- 17 B. Exterior Project Site Areas
 - 18 1. The GC and other Contractors as appropriate shall ensure the following levels of cleanliness are applied
 - 19 to the exterior project site areas.
 - 20 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
 - 21 material waste, job trailers, and the project area are clean and well maintained.
 - 22 b. The construction fence is maintained, erect with no gaps, and properly posted per all regulatory
 - 23 requirements.
 - 24 c. All erosion control measures are properly maintained, cleaned, and repaired as necessary.
 - 25 d. All loose materials (construction or waste) are properly tied or weighted down to resist blowing.
 - 26 e. All construction materials are properly covered with fully functional tarps or plastic wrap,
 - 27 protected from the weather, coverings are tied, strapped, or weighted down to resist blowing.
 - 28 f. Dust control is applied as necessary or as required by any regulatory requirement.
- 29 C. Interior Project Site Areas
 - 30 1. All Contractors shall ensure the following levels of cleanliness are applied to the interior project site
 - 31 areas.
 - 32 a. The overall appearance of the project site is neat and orderly. Defined areas for material storage,
 - 33 material waste, and project area are clean and well maintained.
 - 34 b. Stored materials are kept in original shipping containers whenever possible. Stored materials not
 - 35 in shipping containers are properly stored and protected according to other applicable
 - 36 specifications.
 - 37 c. All scraps and debris shall be properly disposed of as often as necessary to keep work areas,
 - 38 passageways, stairs, and ramps free of debris and clear for emergency exiting.
 - 39 d. Boxes, pallets, and other such shipping containers, are broken down, stored in a consolidated area
 - 40 or, disposed of as often as is necessary.
 - 41 e. Hand tools, supplies, materials, electrical cords not being used are picked up and stored in gang
 - 42 boxes, not left as walking hazards in work areas, passageways, etc.
- 43 D. Job Trailer
 - 44 1. The interior of the job trailer shall be kept clean and available as a work space at all times. The GC shall
 - 45 ensure that the following is provided for within the job trailer:
 - 46 a. Meeting space including tables and chairs.
 - 47 b. Sufficient space for all contractors to access the official construction documents, provide updates,
 - 48 etc.

49
50 **3.3. PROGRESS CLEANING**

- 51 A. This sub-section shall apply to all Progress Cleaning prior to the installation of finishes, fixtures, and trim (IE
- 52 rough-in).
 - 53 1. For the purposes of this section “clean” shall be defined as a level of cleanliness free of dust and other
 - 54 material capable of being removed by use of reasonable effort using a good quality janitor broom and
 - 55 shop-vac.
 - 56 2. Daily cleanings shall be conducted by all contractors at the end of the work day as follows:
 - 57 a. Debris in excavated areas shall be removed prior to backfill and compaction.
 - 58 b. Debris in wall cavities, chase spaces, etc shall be removed prior to enclosing the spaces.

- 1 c. Large items shall be properly stored, returned to designated areas, or disposed of as necessary.
- 2 d. Loose materials shall be properly secured.
- 3 e. Flammable or hazardous materials are properly stored or disposed of.
- 4 3. Weekly cleaning shall be conducted by all contractors as designated by the GC. Weekly cleanings shall
- 5 include all the above for a daily cleaning and other necessary cleaning as designated by the GC.
- 6 B. This sub-section shall apply to Progress Cleaning in preparation for the installation of finishes, fixtures, and trim.
- 7 a. Surfaces receiving finishes shall be thoroughly cleaned prior to contractors applying finish
- 8 materials. The GC shall be responsible for inspecting the area and surfaces being cleaned for
- 9 finish prior to the sub-contractor applying the finish. This shall include but not be limited to the
- 10 following:
- 11 i. Wall surfaces shall be wiped clean of dirt and oily residues, vacuumed free of dust, and
- 12 shall be free of surface imperfections prior to painting or installing wall coverings.
- 13 ii. Metal surfaces shall be wiped clean of dirt and oily residues, and be free of surface
- 14 imperfections prior to painting.
- 15 iii. Flooring shall be broom swept of large and loose items then vacuumed clean of dust and
- 16 small particles, and damp mopped clean and dried prior to installing any flooring finish.
- 17 Additional cleaning may be required depending on the preparation requirements
- 18 recommended by the flooring material manufacturer.
- 19 C. This sub-section shall apply to Progress Cleaning after the installation of finishes, fixtures, and trim.
- 20 1. For the purposes of this section "clean" shall be defined as a level of cleanliness free of dust and other
- 21 material capable of damaging or visually disfiguring finished work, finishes, fixtures, and trim.
- 22 2. Progress Cleaning at this point in the contract shall be conducted immediately as follows:
- 23 a. Dust, dirt, etc shall be swept and vacuumed off of finish flooring and trim.
- 24 b. Liquid spills shall be cleaned up according to the spill type. This shall include drips and spills
- 25 caused by paint, stain, sealants, and other such items.
- 26 3. The Contractor(s) at no additional cost to the Owner shall be responsible for replacing any finished work,
- 27 finishes, fixtures, and trim damaged or disfigured because of inadequate or improper cleaning.
- 28

3.4. FINAL CLEANING

- 30 A. As noted in Specification 01 29 76 Progress Payment Procedures, Progress Payment Milestone Schedule, Final
- 31 Cleaning shall not be conducted prior to requesting the 90% contract total progress payment and all of the
- 32 following shall be complete:
- 33 1. All final regulatory inspections including but not limited to Building Inspection Department and Madison
- 34 Fire Department inspections have been successfully completed.
- 35 2. All Quality Management Observation (QMO) reports have been closed out.
- 36 3. All Demonstration and Training has been completed.
- 37 4. All Attic Stock has been consolidated and located to its designated area
- 38 5. All protection for installed construction shall be removed prior to final cleaning by the contractor
- 39 responsible for providing the protections. This shall include the removal of any adhesive residues left
- 40 behind from tapes. Contractors shall only use manufacturer authorized cleaning materials for removing
- 41 adhesives, etc.
- 42 B. For the purposes of this section "clean" shall be defined as a level of cleanliness generally provided by skilled
- 43 cleaners using commercial quality building maintenance equipment and materials.
- 44 C. The GC shall be responsible for ensuring that all requirements under this section are being met.
- 45 D. General Requirements
- 46 1. Employ experienced personnel or professional cleaners for final cleaning as necessary for the areas or
- 47 equipment being cleaned.
- 48 2. Cleaning equipment used shall be commercial grade equipment commonly used by professional cleaners.
- 49 3. Cleaning equipment and materials shall be cleaned, rinsed, or replaced to ensure a uniform level of
- 50 cleanliness is being maintained during the final cleaning. This shall include but not be limited to the
- 51 following:
- 52 a. Vacuum cleaner bags and/or filters are changed and/or cleaned as often as necessary.
- 53 b. Dust & wipe down rags are washed, rinsed, or replaced before starting each room.
- 54 c. Mopping equipment
- 55 i. Mop water for washing shall have cleaning solution added to the amount and temperature
- 56 per manufacturer's recommendations. Mop washing water shall be replaced often to
- 57 maintain the levels of the cleaning solution and temperature required.
- 58 ii. Mop water for rinsing shall remain clean, clear, and be replaced as often as necessary.

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- iii. Mop heads shall be rinsed often and replaced as necessary.
 - iv. Mop heads and buckets shall be thoroughly rinsed with each change of water.
 - v. Only new mop heads shall be used for rinsing.
- E. Refer to all other specifications in this contract for specific requirements regarding final cleaning of finishes, fixtures, equipment, etc.
 - F. Exterior Cleaning shall include but not be limited to the following:
 1. All exterior glazing surfaces have been professionally cleaned and are free of dust and streaking.
 2. Metal roofs, siding, and other surfaces shall be clean of dirt and free of splashed or excess materials such as sealants, mortar, paint, etc.
 3. All exterior furnishings shall be clean, waste receptacles shall be empty.
 4. Paved areas shall be clean, free of dirt, oily stains and other such blemishes
 5. Exterior lights and diffusers are clean and free of dust.
 - G. Interior Cleaning shall include but not be limited to the following:
 1. Remove all labels, stickers, tags, and other such items which are not required by code as permanent labels.
 2. All interior glazing surfaces, including mirrors, have been professionally cleaned and are free of dust and streaking.
 3. All interior surfaces have been cleaned of excess materials such as paint, sealants, etc and have been wiped free of dust.
 4. Interior metals, fixtures, and trim have been cleaned free of dust and oily residues
 5. Carpet flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains removed per manufacturers use and care instructions.
 6. Resilient flooring has been thoroughly cleaned; vacuumed free of dust, excess glues and other stains removed, mopped and buffed per manufacturers use and care instructions.
 7. Interior non-occupied concrete floors shall be broom cleaned, vacuumed free of dust, excess glues and other stains removed per manufacturers use and care instructions.
 8. Light fixtures, lamps, diffusers and other such items have been dusted and cleaned as necessary.

3.5. CALL BACK WORK

- A. The GC shall be responsible for ensuring that any contractor returning to the project site for completion or correction work has re-cleaned and restored the area to the levels described in section 3.4 above upon completion of the work. This shall include but not be limited to the following:
 1. The immediate area(s) where work was completed.
 2. Adjacent areas where dust or debris may have traveled.
 3. Other areas occupied during the completion of the call back work.
 4. Path of entrance/exit, to/from the area(s) of work.

END OF SECTION

**SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

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PART 1 – GENERAL

1.1. SUMMARY

- 24 A. This specification includes administrative and procedural requirements for the recycling, re-use, salvaging, and
25 disposal of non-hazardous construction and demolition waste.
26 B. The General Contractor (GC) shall be fully responsible for complying with all applicable ordinances and other
27 such regulatory requirements during the execution of this contract.
28

1.2. RELATED SPECIFICAITONS

- 30 A. 01 29 76 Progress Payment Procedures
31 B. 01 31 23 Project Management Web site
32 C. 01 32 19 Submittals Schedule
33 D. 01 33 23 Submittals
34 E. 01 77 00 Closeout Procedures
35 F. Other Divisions and Specifications that may address the proper disposal of construction or demolition waste as it
36 pertains to work being conducted under that particular specification.
37

1.3. CITY ORDINANCES

- 39 A. There are two (2) Madison General Ordinances (MGO) that the City of Madison has regarding construction and
40 demolition waste.
41 1. MGO 10.185, Recycling and Reuse of Construction and Demolition Debris, describes the requirements
42 associated with this ordinance including definitions, documentation requirements, and penalties.
43 2. MGO 28.185, Approval of Demolition (Razing, Wrecking) and Removal, describes the requirements
44 associated with applying for and receiving a demolition permit.
45 B. All City of Madison, Board of Public Works, contracts being conducted by City Engineering, Facility Management,
46 for construction, remodeling, or demolition shall comply with the above ordinances regardless of project type or
47 size.
48

1.4. DEFINITIONS

- 50 A. Clean: Untreated and unpainted material, free of contamination caused by oils, solvents, caulks, and other
51 chemicals.
52 B. Construction and Demolition Debris: Materials resulting from the construction, remodeling, repair, and
53 demolition of utilities, structures, buildings, and roads.
54 C. Disposal: Off-site removal of construction and demolition debris and the subsequent sale, recycling, reuse, or
55 deposit in authorized landfill or incinerator.
56 D. Hazardous: Exhibiting the characteristics of hazardous substance, i.e. ignitability, corrosiveness, toxicity, or
57 reactivity and including but not limited to asbestos containing materials, lead, mercury and PCBs.
58 E. Non-hazardous: Exhibiting none of the characteristics of a hazardous substance.

- 1 F. Nontoxic: Not immediately poisonous to humans or poisonous after a long period of exposure.
- 2 G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured
- 3 into a new product.
- 4 H. Recycle: Any process by which construction or demolition debris is diverted from final disposal as solid waste at
- 5 a permitted landfill and instead is collected, separated, and/or processed into raw materials for new, reused, or
- 6 reconstituted products; or for the recovery of materials for energy production processes.
- 7 I. Recycler: Any recycling facility, transfer station, or other waste handling facility which accepts construction and
- 8 demolition debris for recycling, or for other transferring to a recycling facility.
- 9 J. Recycling: The process of sorting, cleaning, treating, or reconstituting solid waste and other discarded materials
- 10 for the purpose of preparing the material to be recyclable. Recycling does not include burning, incinerating or
- 11 thermally destroying waste.
- 12 K. Return: To give back reusable items or unused products to vendors for credit.
- 13 L. Reuse: Shall mean any of the following:
- 14 1. The on-site use of reprocessed construction and demolitions debris.
- 15 2. The off-site redistribution of a material, for use in the same manner or similar manner at another
- 16 location.
- 17 3. The use of non-toxic, clean wood as an alternative fuel source.
- 18 M. Salvage: To remove a waste material from the project site for resale or reuse by the Owner or others.
- 19 N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- 20 O. Trash: Any product or material unable to be re-used, returned, recycled, or salvaged.
- 21 P. Waste: Extra materials or products that have reached the end of its useful life or its intended use. Waste
- 22 includes salvageable, returnable, recyclable and re-useable construction and demolition materials, and trash.
- 23

24 1.5. PERFORMANCE REQUIREMENTS

- 25 A. The GC shall develop a Waste Management Plan that results in end-of-project rates for salvage/recycling/reuse
- 26 of 95 percent (minimum) by weight of the total waste generated by the Work. Percentages may be adjusted on
- 27 a project by project basis depending on selected LEED goals associated with the project.
- 28 B. The GC shall salvage or recycle 100 percent of all uncontaminated packaging materials including but not limited
- 29 to the following:
- 30 1. Paper
- 31 2. Cardboard
- 32 3. Beverage containers
- 33 4. Boxes
- 34 5. Plastic Sheet and film
- 35 6. Polystyrene packaging
- 36 7. Wood crates and pallets
- 37 8. Plastic pails and buckets
- 38 C. Promote a resourceful use of supplies and materials through proper planning and handling. Generate the least
- 39 amount of waste possible by minimizing errors, poor planning, breakage, mishandling, contamination or other
- 40 similar factors.
- 41 D. Use all reasonable means to divert construction waste from landfills and incinerators through recycling, reuse, or
- 42 salvage as appropriate.
- 43

44 1.6. SUBMITTALS AND DELIVERABLES

- 45 A. The GC shall provide their completed Waste Management Plan to the Project Management Web Site as a
- 46 submittal for review by the Project Architect and City Project Manager.
- 47 1. See item 1.8 below for Waste Management Plan submittal requirements.
- 48 2. The Waste Management Plan shall be completed, submitted, and approved as a pre-requisite for
- 49 Progress Payment number 1.
- 50 3. Copies of all documentation required by this specification shall be submitted to the appropriate Project
- 51 Management Web Site Library. Documentation shall be reviewed by the City Project Manager during all
- 52 Progress Payment reviews for compliance and accuracy.
- 53 B. The Waste Management Coordinator shall provide copies of items 1 through 5 below to the appropriate Project
- 54 Management Web Site Library and shall update the Waste Management Summary Log to reflect the records
- 55 being submitted.
- 56 1. Records of Donations: Indicate receipt and acceptance of itemized salvageable waste donated to
- 57 individuals or organizations. Indicate if the organization is tax exempt.

- 1 2. Records of Sales: Indicate receipt and acceptance of itemized salvageable waste sold to individuals or
2 organizations. Indicate if the organization is tax exempt.
- 3 3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by
4 recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and
5 invoices.
- 6 4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and
7 incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
- 8 5. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering
9 refrigerant shall provide the GC with a statement indicating all of the following:
10 a. All recovery was performed according to EPA Regulations.
11 b. All refrigerant present was recovered; indicate the total quantity recovered by unit.
12 c. Date of Recovery.
13 d. Name, address, company name, and phone number of technician performing the recovery.
14 e. Technician shall sign and date the statement.
- 15 C. LEED Submittal: The GC shall provide the following information using the appropriate LEED letter template upon
16 project completion: indicating that the requirements of the credit have been met. *NOTE: This requirement shall*
17 *only apply to projects having a LEED certification goal.*
18 1. Total waste material generated.
19 2. Total waste material diverted by diversion method; recycling, salvage, re-use, etc.
20 3. Which waste streams have been diverted; minimum four different streams required to achieve LEED
21 credit
22 4. Statement that the credit requirements have been met.
23 5. GC shall sign the letter.

24
25 **1.7. QUALITY ASSURANCE**

- 26 A. Waste Management Coordinator: The GC shall be responsible for designating a Waste Management
27 Coordinator. Coordinator may be the GC Supervisor, GC Project Manager or other member of the GC staff
28 having knowledge of proper waste management procedures and all applicable regulations.
- 29 B. Regulatory Requirements: comply with all hauling and disposal regulations of authorities having jurisdiction.
- 30 C. The Waste Management Coordinator shall comply with Specification 01 31 19 Project Meetings, Section 3.7.B.1
31 and conduct a Waste Management Conference at the job site. This conference shall be repeated as necessary as
32 additional trades are added to the Work. The conference shall include but not be limited to the following:
33 1. Identify the Waste Management Coordinator; provide trade contractors with name, phone, and email
34 information.
35 2. Review and discuss the Waste Management Plan and the roles of the Coordinator.
36 3. Review the requirements for documenting and reporting procedures of each type of waste and its
37 disposition.
38 4. Review procedures for material separation; indicate availability and locations of containers and bins.
39 5. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
40 6. Review waste management procedures specific to each trade.
- 41 D. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

42
43 **1.8. WASTE MANAGEMENT PLAN**

- 44 A. Develop a plan consisting of waste identification, a waste reduction work plan, and cost/revenue analysis.
45 Indicate quantities by weight or volume. Use the same units of measure throughout the waste management
46 plan.
47 1. Waste Identification: Indicate anticipated types and quantities of site clearing, demolition waste, and
48 construction waste that will be generated during the execution of this contract. Include assumptions for
49 the estimates.
50 2. Waste Reduction Work Plan: The work plan shall consist of but not be limited to all of the following:
51 a. Identify methods for reducing construction waste. Re-using, framing and forming materials, re-
52 planning material cuts to minimize waste, etc.
53 b. Identify what types of materials will be recycled. Provide lists of local companies that receive
54 and/or process the materials. Include names, addresses, and phone numbers.
55 c. Identify what types of materials will be disposed of and whether it will be disposed of in a landfill
56 facility or by incineration facility. Provide lists of local companies that receive and/or process the
57 materials. Include names, addresses, and phone numbers.
58 d. Identify methods to be used on site for separating waste including all of the following:

- 1 i. Sizes of containers to be used.
- 2 ii. Labels to be used on the containers to identify the type of waste allowed in the container.
- 3 iii. Designated locations on the project site for waste material containers.
- 4 B. If project requires demolition incorporate the ordinance required (MGO 28.185) Recycling and Reuse Plan into
- 5 the Waste Management Plan.
- 6 C. Provide all of the following for the Waste Management Coordinator:
- 7 1. Name, employer, employer address, phone number, and email address of the designated coordinator.
- 8 a. The GC shall also provide this information with the required Project Directory Submittal at the
- 9 beginning of the project.
- 10 D. If at the option of the GC, they choose to contract with a Waste Management Disposal Company that allows
- 11 comingled and unsorted waste materials, the GC shall include with their Waste Management Plan the following:
- 12 1. Name, address, phone number, state permitting information, and other pertinent information about the
- 13 disposal company.
- 14 2. Documentation from the disposal company indicating company policies and procedures regarding
- 15 comingled and unsorted waste materials to include:
- 16 a. GC responsibilities on the project site.
- 17 b. Disposal company procedures for receiving, sorting, recycling, and disposing of comingled and
- 18 unsorted waste material.

19
20 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

21
22 **PART 3 - EXECUTION**

23
24 **3.1. PLAN IMPLEMENTATION**

- 25 A. Implement the approved waste management plan. Provide adequate containers, storage space, signage,
- 26 transportation and other items required to implement the plan during the execution of this contract.
- 27 B. The GC and Waste Management Coordinator shall be responsible for monitoring and reporting the status of the
- 28 Waste Management Plan and shall monitor the waste management practices on site as frequently as needed.
- 29 C. Train all workers, sub-contractors, and suppliers on proper waste management procedures as appropriate for
- 30 the work being conducted on the project site.
- 31 1. Distribute the waste management plan to everyone concerned within seven (7) days of submittal
- 32 approval.
- 33 2. Distribute the waste management plan to new workers, sub-contractors, and suppliers when they first
- 34 appear on the project site.
- 35 3. Conduct additional training as needed during the execution of the contract to keep a positive focus on
- 36 the waste management plan.
- 37 D. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways,
- 38 and other adjacent and used facilities.
- 39 1. Designate and label specific areas on the project site necessary for separating materials to be salvaged,
- 40 recycled, reused, donated, and sold.
- 41 2. Comply with any specification or regulatory requirements pertaining to dust, dirt, environmental
- 42 protection, and noise control.

43
44 **3.2. HAZARDOUS AND TOXIC WASTE**

- 45 A. The Owner shall be responsible under separate contract for the removal of any asbestos related materials. All
- 46 other materials shall be removed by the GC.
- 47 B. All hazardous and toxic waste shall be separated, stored, and disposed of according to all applicable regulations.
- 48 C. All hazardous and toxic materials on site shall have a Material Safety and Data Sheet (MSDS) available that
- 49 indicates storage requirements, emergency information, and disposal requirements as necessary.

50
51 **3.3. GENERAL GUIDELINES FOR ALL WASTES**

- 52 A. Recycle all paper and beverage containers used by workers, sub-contractors, suppliers and visitors to the project
- 53 site.
- 54 B. All revenues, savings, rebates, tax credits, and other such incentives received from recycling, reusing, or
- 55 salvaging waste materials shall accrue to the GC unless specified otherwise in the contract documents.
- 56 C. Separate recyclable, reusable, and salvageable waste from other waste materials, trash, and debris except where
- 57 Waste Management Disposal Company allows comingled waste materials, see section 1.8.D above.

- 1 1. Separate by type in appropriate containers or designated areas according to the approved waste
- 2 management plan away from the construction area. Do not store within the drip lines of existing trees.
- 3 2. Inspect containers and bins frequently for contamination and inappropriately sorted materials. Remove
- 4 contaminated materials and resort as necessary.
- 5 3. Stockpile bulk materials such as sand, topsoil, stone, etc., on site away from the construction area and
- 6 without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water, and
- 7 cover to prevent windblown dust. Do not store within the drip lines of existing trees.
- 8 4. Whenever possible store items off the ground and/or protect them from the weather.
- 9

10 **3.4. GUIDELINES FOR RECYCLABLE, RE-USABLE, AND SALVAGEABLE WASTE**

- 11 A. The following guidelines is not a complete or all inclusive list and shall be adjusted as needed by the methods
- 12 and procedures identified in the Waste Management Plan.
- 13 B. Asphalt Paving: Break-up into transportable pieces or grind, transport to an authorized recycling facility.
- 14 C. Carpet and Pad: Separate carpet and pad scraps, containerize and transport to an authorized recycling facility.
- 15 D. Ceiling System Components: Suspended ceiling system components shall be sorted by material type as follows:
- 16 1. Broken, cut, or damaged tiles shall be containerized, transport to an authorized recycling facility.
- 17 2. Damaged, or cut tracks, trim and other metal grid system components shall be sorted with other metals
- 18 of similar types, palletize, transport to an authorized recycling facility.
- 19 E. Clean Fill: When allowed by Division 31 Specifications; concrete, masonry, stone, asphalt pavement, sand and
- 20 other such materials may be used as clean fill on this project site. The GC shall verify with the Project Architect,
- 21 Structural Engineer, or Civil Engineer as necessary prior to using any materials as clean fill. Materials shall be
- 22 processed, placed, and compacted as specified. If not being re-used on site, transport to an authorized recycling
- 23 facility.
- 24 F. Clean Wood Materials: Including but not limited framing cutoffs, wood sheathing or paneling materials,
- 25 structural or engineered wood products, and pallets or crates. Clean Wood shall be free of paints, stains, oils,
- 26 preservatives and other such contaminants.
- 27 1. Useable pieces shall be sorted by type and dimension, bundled and transported off site by the GC or
- 28 returned to the supplier.
- 29 2. Non-useable pieces shall be palletized or containerized, transport to an authorized recycling facility.
- 30 3. Clean, uncontaminated sawdust and wood shavings shall be bagged, transport to an authorized recycling
- 31 facility.
- 32 G. Concrete: Break-up into transportable pieces, remove all reinforcing and other metals, transport to an
- 33 authorized recycling facility.
- 34 H. Glass Products: Shall be sorted by types, do not include light fixture lamps and bulbs. Products broken in
- 35 shipment shall be returned to the supplier. Broken or cracked items still in frames shall be taped to prevent
- 36 further breakage and injury to workers. Transport to an authorized recycling facility.
- 37 I. Gypsum Board: Stack large clean pieces on wooden pallets or container, store in a dry location, transport to an
- 38 authorized recycling facility.
- 39 J. Light Fixture Lamps and Bulbs: Fluorescent tubes shall be containerized, transport to an authorized recycling
- 40 facility.
- 41 K. Masonry and CMU: Remove all metal reinforcing, anchors, and ties, clean undamaged pieces and neatly stack on
- 42 pallets, transport damaged pieces to an authorized recycling facility.
- 43 L. Metals: Sort metals by type as follows, this does not include piping:
- 44 1. Architectural metals including but not limited to siding, soffit, and roofing panels shall be sorted by
- 45 material, palletize or bundle as needed and transport to an authorized recycling facility.
- 46 2. Structural steel, sort by size and type; palletize and transport to an authorized recycling facility.
- 47 3. Miscellaneous metals such as aluminum, brass, bronze, etc shall be sorted by type, containerized or
- 48 palletized as necessary, transport to an authorized recycling facility.
- 49 M. Packaging and shipping materials
- 50 1. Cardboard boxes and containers: Breakdown all cardboard boxes and containers into flat sheets. Bundle
- 51 and store in a dry location until transported for recycling.
- 52 2. Pallets:
- 53 a. Whenever possible require deliveries using pallets to remove them from the project site.
- 54 b. Neatly stack pallets in preparation for reusing them or providing them to other companies for
- 55 salvage or re-use.
- 56 c. Break down pallets into component wood pieces that comply with the requirements for recycling
- 57 clean wood materials. Neatly stack or palletize pieces in preparation for transportation.

- 1 3. Crates: Break down crates into component wood pieces that comply with the requirements for recycling
- 2 clean wood materials. Neatly stack or palletize pieces in preparation for transportation.
- 3 4. Polystyrene Packaging: Separate and bag materials.
- 4 N. Piping and conduit: Reduce all piping and conduit to straight lengths, sort and store by size, material and type.
- 5 Remove supports, hangers, valves, boxes, sprinkler heads, and other such components, sort and store by size,
- 6 material and type. Transport to authorized recycling facilities according to material types.
- 7 O. Roofing: Roofing materials shall be sorted and containerized by type, transport to authorized recycling facilities
- 8 according to material types.
- 9 P. Site-Clearing Waste: Sort all site waste by type.
- 10 1. Only stockpile soils types and quantities required for re-use on the project site. All remaining quantities
- 11 shall be transported off site to an authorized facility that receives such materials.
- 12 2. Brush, branches, and trees with no marketable re-use shall be transported to facilities for chipping into
- 13 mulch.
- 14 3. Trees with a marketable re-use shall be salvaged and transported to facilities that specialize in processing
- 15 trees for future use as wood products.
- 16

17 **3.5. GUIDELINES FOR DISPOSAL OF WASTES**

- 18 A. The following guidelines shall be adjusted as needed by the methods and procedures identified in the Waste
- 19 Management Plan.
- 20 B. Any waste that is contaminated, organic, or cannot be recycled, re-used, or salvaged shall be legally disposed of
- 21 in an authorized landfill or incinerator. Disposal methods shall follow all applicable regulatory requirements.
- 22 C. No waste material of any kind, except those types designated as clean fill in section 3.4 above, shall be allowed
- 23 to be buried on the project site at any time.
- 24 D. No burning of any kind of waste material shall be permitted on this project site at any time.
- 25 E. Paint and Stain: Paints, stains, and their containers shall be disposed of as follows:
- 26 1. Whenever possible containers should be thoroughly cleaned immediately after emptying and sorted with
- 27 as appropriate (metal or plastic) for recycling
- 28 2. Empty containers, regardless of type or base material, may be disposed of with lids off with general
- 29 garbage.
- 30 3. Latex paint may be placed with general garbage if properly solidified as follows:
- 31 a. Small amounts (an inch or less in can): Remove lids and allow paint to dry out in the can and
- 32 harden. Protect cans from rain and freezing.
- 33 b. Large amounts (more than one inch): Mix paint with equal amounts of cat litter, stir and allow to
- 34 completely dry. Alternate method: mix with commercial paint hardener.
- 35 4. Oil-based or combustible paints and stains, regardless of liquid or solid, shall be transported to an
- 36 approved facility that takes such items such as Dane County Clean Sweep Sites.
- 37 F. Treated Wood Materials: Treated wood materials including but not limited to wood that has been painted,
- 38 stained, or chemically treated shall not be recycled or incinerated.
- 39
- 40
- 41

42 **END OF SECTION**

43

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

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PART 1 – GENERAL

1.1. SUMMARY

- 25 A. The purpose of this specification is to provide clear responsibilities, guide lines, and requirements related to
26 providing protection to already installed construction.
27 B. Already installed construction shall include but not be limited to the following:
28 1. Any existing site feature such as pavement, curbs, drainage features, utilities, landscaping features (trees,
29 shrubbery, plantings, flagpoles, etc) and other such exterior items not associated with the building
30 whether on or adjacent to the project site.
31 2. Any existing structure on or adjacent to the project site.
32 3. Any existing interior work that may be adjacent to the new work including all paths of ingress/egress to
33 areas associated with accessing the Work.
34 4. Any existing feature of any kind within the public right-of-way that may be on the project site property,
35 adjacent to the project site or across the street from the project site.
36 C. All contractors shall be familiar with the specifications of their Division of Work for specific requirements on
37 protection of the Work.
38 D. The requirements noted within this specification do not relieve any contractor of the responsibility for
39 compliance with any code, statute, ordinance, or other such regulatory requirement having jurisdictional
40 authority over these contract documents.
41

1.2. QUALITY ASSURANCE

- 43 A. It shall be the responsibility of every contractor and worker assigned to the project to be diligent in protecting all
44 existing work, and newly installed construction.
45 B. It shall be the General Contractors’ (GC) responsibility under the contract to provide all reasonable protection
46 methods, materials, or precautionary measures required to protect new or existing construction as described in
47 within this specification to the project as a whole.
48 1. The GC shall be responsible to ensure any damaged new or existing construction is repaired or replaced
49 at no additional cost to the Contract.
50 2. The GC at their discretion may direct other contractors to provide and maintain protection of completed
51 work associated with their Division of Work. I.E.: The carpet installer may be required by the GC to
52 provide carpet protection along traveled paths, ingress/egress, etc after installation.
53 C. It shall be the responsibility of the GC to ensure that all materials being used to protect installed construction are
54 compatible with, and/or adjacent to, the materials being protected. This shall include but not be limited to the
55 material used as covering, tapes used to fasten protective materials, etc.

1
2 **1.3. RELATED SPECIFICATIONS**

- 3 A. Parts of this specification will reference articles within “The City of Madison FACILITIES MANAGEMENT
4 SPECIFICATIONS for Public Works Construction”.
- 5 1. Use the following link to access the FACILITIES MANAGEMENT SPECIFICATIONS web page:
6 <http://www.cityofmadison.com/business/pw/specs.cfm>
- 7 a. Click on the “Part” chapter identified in the specification text. For example if the specification
8 says “Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2” click the link for
9 Part II, the Part II PDF will open.
- 10 b. Scroll through the index of Part II for specification 210.2 and click the text link which will take you
11 to the referenced text.
- 12 c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.
- 13 B. Section 01 60 00 Product Requirements
- 14 C. Section 01 74 13 Progress Cleaning

15
16 **PART 2 - PRODUCTS**

17
18 **2.1. FENCING MATERIALS AND BARRICADES**

- 19 A. Except where noted in other areas of the construction documents, the responsible contractor shall provide a six
20 foot galvanized chain link fence including full height mesh screen at the project lines as shown on the Civil
21 Drawings. For temporary barricade situations, the responsible contractor may provide one of the following that
22 sufficiently provide a sturdy physical barrier and/or visual barrier as necessary for the intended application.
- 23 1. Standard orange construction barrels each with a standard rubber base ring and reflective tape
24 a. Provide flashing amber lights as needed to increase night time visibility
- 25 2. Steel “T” style fence posts
- 26 3. 4’0” high standard orange construction fence
- 27 4. Traffic barricades
- 28 5. Jersey barriers
- 29 6. Other types of fencing or barricades typically used in the construction industry
- 30 B. The contractor responsible for providing the fencing materials and barricades shall also be responsible for
31 maintaining them. This shall include but not limited to fixing damaged fencing, standing up barrels that have
32 been knocked over, realigning barrels, and ensuring flashing lights are fully operational at all times.
- 33 C. The following fencing and barricade designations, and their use descriptions shall be used throughout this
34 specification to provide uniformity in describing protection requirements.
- 35 1. Type A, Jersey Barriers, to be used as permanent blocking devices to deny access to alternate project site
36 entrances or exits.
- 37 2. Type B, Traffic Barricades, to be used as temporary blocking devices to deny access to alternate project
38 site entrances or exits.
- 39 3. Type C, Construction Barrels without construction fencing shall be used for lane closures, temporary
40 blocking devices to deny access and the protection of single locations (I.E. identify the location of an
41 access structure) that do not require fencing.
- 42 4. Type D, Construction Barrels with construction fencing where it becomes necessary to surround an object
43 with a complete visual barricade and it is impractical or unacceptable to install fence posts. The surround
44 shall be constructed in such a manner as to provide a buffer zone around and access to the item being
45 protected.
- 46 5. Type E, Steel “T” Fence Posts shall be used at the project lines, as indicated on the Civil Drawings, with six
47 foot galvanized chain link fencing to surround an object with a complete visual barricade and it is
48 practical to install fence posts. The surround shall be constructed in such a manner as to provide a buffer
49 zone around and access to the item being protected. All posts shall be driven installed. Surface mounted
50 posts to only be used for temporary barricades.
- 51 6. Type X, Other fencing or barricade types that may be designated and detailed within the construction
52 documents shall use additional alpha numeric designations.

53
54 **2.2. EROSION CONTROL PROTECTION**

- 55 A. Refer to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.2 for authorized materials associated
56 with erosion control materials.
- 57

1 **2.3. INTERIOR FINISH PROTECTION MATERIALS**

- 2 A. Except where noted in other areas of the construction documents or this specification the responsible
3 contractor:
4 1. Shall not provide the cheapest or least effective method as an effort to meet any protection requirement.
5 2. Shall provide materials of sufficient quality, and durability to provide adequate protection based on the
6 seasonal conditions and the anticipated duration at the time the protection will be needed.
7 3. Shall provide sufficient quantity of protection material to protect the construction as needed.
8 B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect
9 (PA)/Project Engineer (PE) and City Project Manager (CPM) the proposed plan for protection, materials to be
10 used and samples as necessary.
11 1. The PA/PE and CPM reserve the right to disapprove any proposed method and/or material and/or make
12 alternate proposals.
13

14 **PART 3 - EXECUTION**

15
16 **3.1. GENERAL EXECUTION REQUIREMENTS**

- 17 A. The GC shall be responsible for ensuring all of the following procedures and requirements are implemented as
18 needed for the duration of the Work performed under this contract.
19 B. The GC shall also be responsible for the following:
20 1. Reporting any incident of damage to existing property, right-of-way, or utility to the CPM immediately
21 upon rendering the incident safe, and notifying emergency response teams, and emergency utility crews
22 as needed.
23 2. Conduct a site walk through prior to leaving at the end of each day to assess:
24 a. Protection measures are properly in place, provide correction actions as necessary.
25 b. Note damage to existing completed work and schedule repair/replacement as needed.
26 3. Ensure all contractors and workers are being diligent in protecting existing work, and newly installed
27 construction.
28

29 **3.2. PROTECT ADJACENT PROPERTIES**

- 30 A. Whenever possible through the design process the City of Madison shall have previously provided notice to
31 adjacent property owners that work will be occurring on or near their property. The City of Madison shall also
32 have obtained any permanent or temporary easements that may be necessary to complete any Work on
33 adjacent properties.
34 B. It shall be the responsibility of the GC to do the following for all Work under this contract being performed on or
35 adjacent to the property line:
36 1. Contact the adjacent property owner and provide them with information on the work to be done,
37 equipment to be used, and estimated duration of the work. Information to be updated and
38 communicated to property owner(s) as construction progresses and site conditions change.
39 a. If any adjacent property is a rented or leased space the GC shall also make contact and provide
40 the same information to the tenants.
41 b. Determine from the owner and/or tenants if there are any concerns for children, pets, special
42 plantings, or other concerns.
43 2. Discuss the following with all contractors performing work on or near the property line.
44 a. Work to be completed and timeline.
45 b. Concerns of adjacent property owners/tenants from item 1 above.
46 c. Which protective measures will be necessary to protect adjacent properties and address the
47 concerns of adjacent property owners/tenants.
48 3. Ensure all protective measures are placed and maintained during the execution of Work on or adjacent to
49 the property line. Interact with the adjacent property owners/tenants as needed.
50 C. Any contractor doing work on or adjacent to the property line shall install and maintain any protective measure
51 identified in the contract documents, this specification, or as directed by the GC.
52 D. The GC shall be responsible for restoring any damage to structure and property located on or adjacent to the
53 property line.
54 1. Restoration shall include but not be limited to repair or replacement using like materials and finishes to
55 its original condition or better.
56 2. Restoration of landscaping materials shall include watering of any seed, sod, or other planting of any kind
57 for a reasonable period of time to encourage germination and root development.
58 E. The GC shall keep the CPM informed directly to any issues pertaining to adjacent property owners and tenants.

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3.3. PROTECT LANDSCAPING FEATURES

- A. Except where specifically stated in other areas of the construction documents the following minimal protection requirements shall apply under this section.
 - 1. Whenever possible do not install new landscape features until exterior building construction has been completed, equipment such as scaffolding and lifts are no longer needed and have been removed, and heavy equipment operation is no longer required.
 - 2. Whenever possible remove and temporarily store all existing landscape features such as benches, waste receptacles, signage, and other such features that will be within the area of Work that can be removed.
 - 3. Landscape features that cannot be removed such as flag poles, light poles, light bollards, etc. shall be protected with Type D fencing for areas on pavement or Type E fencing for areas on soil.
 - 4. Planting beds shall be protected using Type E fencing around the exposed perimeter of the planting bed as needed.
 - 5. The City of Madison FACILITIES MANAGEMENT SPECIFICATION 107.13 shall apply to all tree protection in and around the project site at all times.

3.4. PROTECT UTILITIES

- A. The contractor shall be responsible for notifying all utilities to determine emergency response procedures and protection requirements prior to installing any construction protection.
 - 1. This includes requesting utility marking through Diggers Hotline.
 - a. Call 811 or 1-800-242-8511 to request a public utility locate
 - b. For emergency locate call (262) 432-7910 or (877) 500-9592
 - 2. Contact the Owner and CPM for any available private utility information on the property that may be available prior to calling a private utility locating company.
- B. Except where specifically stated in other areas of the construction documents the following minimal protection requirements shall apply under this section.
 - 1. Hydrants, lamp posts, electrical transformers, and other utility pedestals shall be protected with Type D fencing for areas on pavement or Type E fencing for areas on soil. Fence posts shall be located so as to not be directly over the utility main.
 - 2. Storm sewer structures in pavement shall have proper inlet protection according to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.1(g) and Type C Construction Barrels when necessary.
 - 3. Storm sewer structures in turf and other landscaped areas shall have proper inlet protection according to City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.1(g) and Type E fencing for areas on soil.
 - 4. Stormwater management features such as greenways, retention/detention ponds, bio-filtration ponds and other such features shall be properly protected according to the appropriate erosion control measure specified on the Erosion Control Plan. See multiple sections of City of Madison FACILITIES MANAGEMENT SPECIFICATION 210.1
 - a. For the protection of hard to see items such as structures, castings, inlets, etc. in grassy areas provide Type E fencing for areas on soil.
 - c. For the protection of storm water management features having special soils and plants such as bio-filtration ponds provide Type E fencing for areas on soil.
 - 5. Other structures and covers including but not limited to cleanouts, wiring hand holes, valve boxes, access structures, grease trap structures, etc shall be protected as follows:
 - a. Provide Type E fencing for areas on soil.
 - b. When paving operations are complete provide a construction barrel or cone near structures as necessary depending on required heavy construction traffic.

3.5. PROTECT PUBLIC RIGHT OF WAY

- A. Except where specifically stated in other areas of the construction documents the following minimal protection requirements shall apply under this section.
 - 1. All public right-of-way (area from behind the sidewalk to the centerline of the street) shall remain open and accessible except during periods of active work. At such times the public right of way shall be properly closed and signed as referenced in City of Madison FACILITIES MANAGEMENT SPECIFICATION 107.9.
 - 2. Bus stops and bus stop structures shall remain accessible at all times.
 - 3. Traffic signage and traffic signals, traffic control boxes shall be protected with Type D fencing for areas on pavement or Type E fencing for areas on soil.

- 1 a. Protection at traffic signage/signals shall not obstruct the viewing of the sign/signal for its
2 intended purpose at any time.
- 3 B. When additional protection for traffic control is required, the use of barricades, guardrails, lane closures and
4 other such procedures will be detailed within the construction documents.
- 5 C. When additional protection for overhead sidewalk cover is required the contract documents shall indicate the
6 specific location and structural requirements of the protective structure.
- 7

8 **3.6. PROTECT STORED MATERIALS**

- 9 A. All contractors shall refer to Specification 01 60 00 Product Requirements for all storage and protection
10 requirements of building materials and products delivered to the site.
- 11

12 **3.7. PROTECT WORK - EXTERIOR**

- 13 A. Provide all temporary services that may be required to protect the installed material from heat, cold, humidity,
14 etc, while materials such as concrete, mortar, sealants, paints, etc, are drying and/or curing.
- 15 B. Open trenches, pits, and other such excavations shall be properly covered, lined, or shored as needed during
16 periods of inclement weather to prevent the caving of soils onto existing work in progress. Refer to the
17 appropriate specifications and/or regulatory requirements governing this type of work as necessary.
- 18 C. Provide adequate protection at all openings with heavy duty tarps, plastic sheathing, or wood framing and
19 sheathing as needed to protect interior work in progress from inclement weather as needed.
- 20 D. Protect exterior finishes of all kinds with heavy duty tarps or plastic sheathing as needed while landscaping is
21 being installed through full germination of seeded areas or installation of filter fabric and mulches to keep dust,
22 dirt, and mud off of finished exterior surfaces.
- 23 E. Designate specific curb mounting points and provide wood blocking where small vehicles, skid loaders and other
24 such equipment may need access to areas being landscaped.
- 25 F. Provide plywood turning pads for skid loaders to turn on to prevent tire marking on new pavement.
- 26 G. Do not permit the parking of vehicles with any kind of fluid leaks to park on new pavement.
- 27 H. The contractor shall be responsible for cleaning, repairing, or replacing any completed work or work in progress
28 under this specification as deemed necessary by the CPM without additional cost to the contract.
- 29

30 **3.8. PROTECT WORK - INTERIOR**

- 31 A. The GC shall do all of the following:
- 32 1. Provide all temporary services that may be required to protect the installed material from heat, cold,
33 humidity, etc, while materials such as concrete, mortar, sealants, paints, etc, are drying and/or curing.
- 34 2. Provide adequate visual and/or physical protection as needed to protect newly completed interior work
35 such as paint, flooring material, sealants, grouts, etc that may be drying and/or curing.
- 36 3. Provide adequate space and materials for cleaning boots, tool boxes, supplies, and other items coming
37 into the project site once finish work has begun.
- 38 4. Clean dirtied areas and repair/replace damaged areas immediately.
- 39 B. The contractors responsible for interior work shall be responsible for protecting their work and finishes from dirt,
40 mud, snow, spills, splatters, and physical damage after installation as follows:
- 41 1. Protect vinyl composite, rubber composite, painted/stained concrete, and tiled flooring as follows:
- 42 a. Define foot traffic areas and protect with Ramboard Temporary Floor Protection products as a
43 minimum basis of design or other protection product(s) compatible with installed flooring product
44 if Ramboard is not compatible. Products to be used shall be new.
- 45 i. Tape all edges, seams, etc with a good quality tape that does not leave sticky residue. Do
46 not allow any debris or other material between the installed flooring and the protection
47 material.
- 48 ii. Repair tears immediately, replace worn areas with like material as necessary.
- 49 2. Protect carpeted areas as follows:
- 50 a. Define foot traffic areas and protect with a minimum of 6mil, clear, polyethylene sheeting 3 feet
51 wide. Products to be used shall be new.
- 52 i. Tape all edges, seams, etc with a good quality tape that does not leave sticky residue. Do
53 not allow any debris or other material between the installed flooring and the protection
54 material.
- 55 ii. Repair tears immediately, replace worn areas with like materials as necessary.
- 56 3. Protect all finished walls in high traffic areas with Ramboard Temporary Wall protection products or
57 approved equal.

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- i. Tape all edges, seams, etc with a good quality tape that does not leave sticky residue. Do not allow any debris or other material between the installed flooring and the protection material.
 - ii. Repair tears immediately, replace worn areas with like materials as necessary.
 - 3. Protect counter tops, cabinets, and other finished surfaces with large sheets of thick cardboard or Ramboard products. Do not allow toolboxes, finish materials, parts and other such items to be placed on finished materials.
 - C. All protection shall stay in place until the CPM, PA/PE, and GC mutually deem the project is ready for Final Cleaning. The contractors responsible for protecting the work shall be responsible for removing the protection and removing any adhesive residue at that time. Contractors shall only use manufacturer authorized cleaning materials for removing adhesives, etc.
 - D. Contractors doing work in un-protected areas of finished work shall be required to provide drop cloths and other protection as noted within this specification for the duration of their work.
 1. Finished areas shall be sufficiently covered to accommodate all equipment, and materials being used to complete the work being done.
 2. Finished areas shall be sufficiently covered to prevent splatters, over spray, etc when doing touch-up work.
 3. Contractors who do not provide sufficient protection under this sub-section shall be responsible for any costs associated with cleaning, repairing or replacing already finished construction at no additional cost to the contract.

END OF SECTION

**SECTION 01 77 00
 CLOSEOUT PROCEDURES**

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. The purpose of this specification is to clearly define and quantify the requirements associated with closing a City
 22 of Madison Public Works Contract for facility related work.
 23 B. All contracts have two distinct but related paths. Each path needs to be properly closed independently in order
 24 to close the contract as a whole.
 25 1. Construction closeout is related to closing out all of the Work associated with the construction
 26 documents.
 27 a. It shall be the responsibility of all contractors to be fully aware of the required Work and closeout
 28 requirements involved in their individual trades.
 29 2. Contract closeout is related to closing out all of the administrative aspects of the contract in general.
 30 a. It shall be the responsibility of all contractors to be fully aware of the administrative requirements
 31 required by the contract and to provide the supporting documentation required.
 32 3. Construction Closeout must be completed before Contract Closeout can begin.
 33 C. This specification will provide general knowledge associated with the following areas:
 34 1. Construction Closeout Requirements
 35 2. Construction Closeout Procedure
 36 3. Contract Closeout Requirements
 37 4. Contract Closeout Procedure
 38 5. Final Payment and Certificate of Completion
 39

1.2. RELATED SPECIFICATIONS

- 41 A. Contractors shall review all references to other specifications including specifications relating to the execution of
 42 the Work associated with their Division or Trade.
 43 B. Section 01 29 76 Progress Payment Procedures
 44 C. Section 01 31 23 Project Management Web Site (PMWS)
 45 D. Section 01 32 26 Construction Progress Reporting
 46 E. Section 01 45 16 Field Quality Control Procedures
 47 F. Section 01 74 13 Progress Cleaning
 48 G. Section 01 45 16 Construction Waste Management and Disposal
 49 H. Section 01 76 00 Protecting Installed Construction
 50 I. Section 01 78 13 Completion and Correction List
 51 J. Section 01 78 23 Operation and Maintenance Data
 52 K. Section 01 78 36 Warranties
 53 L. Section 01 78 39 As-Built Drawings
 54 M. Section 01 78 43 Spare Parts and Extra Materials
 55 N. Section 01 79 00 Demonstration and Training
 56 O. Section 01 91 00 Commissioning
 57 P. Other requirements as noted in the contract documents signed by the General Contractor
 58

1 **1.3. DEFINITIONS**

- 2 A. **Substantial Compliance:** A letter provided to the City of Madison Building Inspection and signed by the Project
3 Architect indicating that all Work has been completed to a level that would allow Owner Occupancy and that all
4 construction is in compliance with the construction documents. A copy of this letter is also provided to the
5 State of Wisconsin Department of Health and Safety as necessary to clear plan review requirements. This letter
6 does not represent construction closeout.
- 7 B. **Certificate of Occupancy:** The Regulatory letter from the City of Madison Building Inspection Department
8 indicating that all regulatory requirements and inspections have been completed and the building may now be
9 occupied for its intended use. This letter does not represent construction closeout.
- 10 C. **Certificate of Substantial Completion:** A letter provided by the Department of Public Works, signed by the City
11 Engineer indicating that Construction activities are substantially complete. This letter does represent
12 construction closeout and the date of this letter begins the date of the Warranty Period.
- 13 D. **Construction Closeout:** The point in the contract where all contractual requirements associated the execution of
14 the Work as described in the plans, specifications, and other documents have been successfully met and the
15 items described in 1.3.A, .B, and .C above have been completed.
- 16 E. **Final Progress Payment:** The progress payment associated with achieving Construction closeout as described in
17 1.3.D above. At this point the contractor may request all monies associated with the contract be paid with the
18 exception of held retainage.
- 19 F. **Contract Closeout:** The point in the contract where all contractual requirements associated with the City of
20 Madison, Board of Public Works contract has been successfully met.
- 21 G. **Final Payment:** The final contract payment submittal that may be approved by the City of Madison after all
22 contractual requirements of the Public Works Contract have been met and any remaining monies (retainage)
23 due to the contractor may be released for the Final Payment.
- 24

25 **1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT**

- 26 A. All contractors shall be responsible for properly executing the construction closeout requirements associated
27 with their Work as described in the specifications governing their Work.
- 28 B. The GC shall be responsible for all of the following:
- 29 1. Ensuring that all contractors have met the construction closeout requirements associated with their
30 Work.
- 31 2. Coordinate the collection of all construction closeout deliverables from all contractors, provide the
32 deliverables to the Project Architect and City Project Manager for review as necessary, and ensure all
33 contractors correct deficiencies of deliverables and resubmit as needed for final acceptance.
- 34 3. Ensure all closeout requirements identified in the Construction Closeout Checklist below have been
35 completed as intended by the construction documents.
- 36

37 **1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT**

- 38 A. The City of Madison, Department of Civil Rights (DCR) monitors contract compliance for construction and
39 procurement contracts to ensure that local, state and federal regulations are followed by contractors working on
40 City of Madison Public Works (PW) projects. DCR will monitor all PW projects from contract award through the
41 final payment at the close of the project. Contractors will be required to submit reporting paperwork
42 throughout the PW project process.
- 43 1. Contractors are encouraged to visit the web site identified below for additional information, checklists,
44 forms, and other information provided by DCR as it relates to Contract Compliance.
45 <http://www.cityofmadison.com/Business/PW/contractCompliance.cfm>
- 46 2. Questions regarding the process should be directed to parties and offices as identified on the various
47 forms, documents, and instructions or contact:
48 City of Madison, Department of Civil Rights
49 210 Martin Luther King Jr. Blvd., Room 523
50 Madison, WI 53703
51 (608) 266-4910
- 52 B. All Sub-Contractors have submitted the applicable required documents described in item 1.5.D below to the
53 General Contractor (GC) for Contract Closeout.
- 54 C. The GC has submitted the required applicable documents described in item 1.5.D below for all contractors to the
55 appropriate City of Madison Agency per instructions associated with each submittal.
- 56 D. The documents required for submittal to the City of Madison for Contract Closeout may include any/all of the
57 items listed below depending on contract type. It is the sole responsibility of all contractors to know and submit
58 the required and complete documentation in a timely fashion.

- 1 1. Weekly Payroll Reports
- 2 2. Employee Utilization Reports
- 3 3. Documentation required for Small Business Enterprise (SBE) goals
- 4 4. Other documents as maybe required or requested through the Finalization Review Process

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. CONSTRUCTION CLOSEOUT CHECKLIST

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Construction Closeout Requirements to the GC.
 1. The checklist shall include all items identified within the construction documents that require any of the following (and examples) prior to moving into Contract Closeout Procedures:
 - a. Documents indicating a specified level of performance has been achieved, such as:
 - i. Test reports of all types
 - ii. Startup reports
 - b. Required documentation, such as:
 - i. As-builts and record drawings
 - ii. Operation and maintenance data
 - c. Physical items to be turned over to the owner, such as:
 - i. Attic stock
 - ii. Keys
 - d. Required maintenance completed, such as:
 - i. Ducts cleaned
 - ii. Filters replaced
 - e. Commissioning and LEED related items and submittals
 - f. Owner and Maintenance Training
 - B. Each list shall indicate the title of the closeout requirement, the associated specification of the requirement, the required result or deliverable, the responsible contractor(s), and a column to verify the item has been turned in and completed.
 - C. The GC shall be responsible for all of the following:
 1. Consolidating all the closeout lists into one master Construction Closeout Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below
 2. Upload the completed checklist to the Project Management Web Site for review.
 3. Resubmit the checklist as needed after initial reviews have been completed.
 - D. The GC shall work with all contractors to amend the Construction Closeout Checklist throughout the execution of the project based on changes and modifications as necessary.

<u>Title</u>	<u>Specification</u>	<u>Description</u>	<u>Responsibility</u>	<u>Completed</u>
Quality Management Observation Reports	01 45 16	All QMO reports have been properly responded to, reviewed and closed by the CPM.	All, GC	
As-Built Drawings	01 78 39	As-Built drawings have been reviewed and accepted per the specification	All, GC	
Testing and Balancing of HVAC	23 09 23	Provide final TnB reports indicating design performance has been achieved	HVAC	

3.2. CONSTRUCTION CLOSEOUT REQUIREMENTS

- A. The timely submittal or completion of closeout requirements shall go hand in hand with the Progress Payment Milestone Schedule that can be found in Specification 01 29 76 Progress Payments. No payments shall be made until all requirements for that payment have been met.
 1. The GC and all major Subcontractors, Project Architect /Project EngineerA/E PROJ MGR, and CPM, shall review all requirements for Construction/Contract Closeout during two (2) special meetings.
 - a. The first meeting shall be held at the 50% Contract Total Payment milestone. This meeting shall discuss the requirements associated with various construction/contract closeout documentation and events when they are due with respect to progress payments.

**SECTION 01 78 13
COMPLETION AND CORRECTION LIST**

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PART 1 – GENERAL1
1.1. SUMMARY1
1.2. RELATED SPECIFICATIONS1
PART 2 – PRODUCTS – THIS SECTION NOT USED1
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PART 1 – GENERAL

1.1. SUMMARY

- A. The City of Madison has developed a multi-faceted Quality Management Program that begins with contract signing and runs through contract closeout to ensure the best quality materials, workmanship, and product are delivered for the contracted Work.
 - 1. The Project Management Web Site is a Construction Management tool that provides contractors, consultants, and staff a single on-line location for the daily operations and progression of the Work.
 - 2. The Quality Management Observation (QMO) is an ongoing observation of the construction process as it progresses. The City of Madison does not use a “Punch List” or “Corrections List” as it is typically known throughout the construction industry. The QMO process acts as an “in progress punch list”. Work identified as not in compliance with the contract documents by the Owner, Owner Representatives, Owner Consultants, etc. shall be resolved immediately at the Contractor’s expense. Unresolved issues will be subject to withholding of progress payment(s) until completed.
 - 3. Very stringent expectations are tied to Construction Closeout and Contract Closeout procedures. Specific milestones throughout the project need to be met and the milestones are tied to the Progress Payment Schedule.
- B. All contractors shall be required to review the specifications identified in Section 1.2 below, and other related specifications identified therein to become familiar with the terminology and expectations of this City of Madison Public Works contract.

1.2. RELATED SPECIFICATIONS

- A. Section 01 29 76 Progress Payment Procedures
- B. Section 01 31 23 Project Management Web Site (PMWS)
- C. Section 01 45 16 Field Quality Control Procedures
- D. Section 01 77 00 Closeout Procedures

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

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PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing well
21 documented and complete Operation and Maintenance (O&M) Data related to general facility use, equipment,
22 systems, finishes, and materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and
23 Custodial Personnel) as needed.
24 B. Operation and Maintenance Data shall apply to both of the following categories except where specific
25 requirements are noted under their separate titles as follows:
26 1. Operation and Maintenance Data: Generally shall mean the owner manual that provides information on
27 start-up, shut-down, operation, troubleshooting, maintenance, parts, and other such documentation as it
28 pertains to all equipment and systems installed under the Work.
29 2. Use and Care instructions: Where applicable use and care instructions shall also be considered O&M for
30 such things as flooring, tile, partitions, and other such finishes and trim related items, installed under the
31 Work.
32

1.2. RELATED SPECIFICATIONS

- 33
34 A. Section 01 29 76 Progress Payment Procedures
35 B. Section 01 31 23 Project Management Web Site
36 C. Section 01 77 00 Closeout Procedures
37 D. Section 01 78 13 Completion and Correction List
38 E. Section 01 78 19 Maintenance Contracts
39 F. Section 01 78 36 Warranties
40 G. Section 01 79 00 Demonstration and Training
41 H. Section 01 91 00 Commissioning
42 I. Other Divisions and Specifications that may address more specifically the requirements for O&M Data.
43

1.3. QUALITY ASSURANCE

- 44
45 A. All O&M Data shall meet the requirements identified in Section 1.4 below.
46 B. All contractors shall provide O&M Data for each piece of equipment, system, or finish installed during the
47 installation of the Work. O&M Data shall be provided to the General Contractor (GC) for verification and
48 submittal.
49 C. The GC shall be responsible for receiving all required O&M Data files from all contractors for verifying that all
50 files submitted meet the requirements in Section 1.4 below.
51

1.4. O&M DATA REQUIREMENTS

- 52
53 A. O&M Data shall be provided in digital PDF format as follows:
54 1. PDF files shall be complete first generation consumer useable editions of PDF documents as provided by
55 any of the following:
56 a. Product manufacturer
57 b. Supplier of product
58 c. Product manufacturer internet site

- 1 2. Acceptable PDF files shall have the following functionality:
 - 2 a. Word searchable
 - 3 b. Key areas are bookmarked
 - 4 c. Table of Contents and/or Index linked to content is preferred whenever possible.
- 5 3. Scanned printed material, with word searchable capabilities, saved as a PDF, is not acceptable and will be
- 6 rejected without further review.
- 7 B. O&M Data shall include but not be limited to the following manufacturers' published information as appropriate
- 8 for the equipment, system, material, or finish:
 - 9 1. Installation instructions
 - 10 2. Parts lists, assembly diagrams, explosion diagrams
 - 11 3. Wiring diagrams
 - 12 4. Start-up, shut-down, troubleshooting and other related operation procedures
 - 13 5. Lubrication, testing, parts replacement, and other such maintenance procedures
 - 14 6. General use, care, and cleaning instructions
 - 15 7. Special precautions and safety requirements
 - 16 8. A list of certified equipment vendors, service companies, parts suppliers including company name,
 - 17 address, and phone number
 - 18 9. A list of the recommended spare parts to have on hand at all times
 - 19 10. A list by type of all recommended lubes, oils, packing material, and other maintenance supplies
 - 20 11. Copies of final test reports, balance reports, and other related documentation
 - 21 12. Warranty information for equipment and systems

22 1.5. O&M DATA SUBMITTALS

- 23 A. O&M Data shall be prepared as identified in this specification and shall be submitted for review as per the
- 24 schedule identified in Specification Section 01 29 76, Progress Payment Procedures.
- 25 B. O&M Data Draft submittals will be reviewed for content, procedure, and compliance only. A general critique
- 26 with recommendations for improvement will be made but re-submittals will not be required.
- 27 C. O&M Data Final submittals will be reviewed for content, procedure, and compliance. Re-submittals will be
- 28 required until such time as each submittal is accepted.
- 29

30
31 *NOTE: Acceptance of O&M Data Final submittals is required to be complete prior to scheduling and conducting owner*
32 *related training and construction closeout.*
33

34 **PART 2 – PRODUCTS – THIS SECTION NOT USED**

35 **PART 3 - EXECUTION**

36 3.1. O&M DATA PREPARATION - GENERAL

- 37 A. All contractors shall prepare O&M Data for draft and final submission as follows:
 - 38 1. Obtain digital PDF files for each piece of equipment, system, material or finish as described in Sections
 - 39 1.4.A.1 and 1.4.A.2 above.
 - 40 2. Verify that all information as described in Section 1.4.B above is included with the PDF file. Obtain
 - 41 missing information as necessary for a complete submittal.
- 42 B. Rename each individual PDF file as follows.
 - 43 1. Do not use special characters such as #, %, &, /, etc. These characters are reserved by the Project
 - 44 Management Web Site software the City of Madison uses; however the under-score (or under-bar) '_' is
 - 45 an allowed character.
 - 46 2. Use the following format and examples for renaming your file:
 - 47 a. Format: ***Equipment name_What_BARTILLON HOMELESS SHELTER_Contract number_Year***
 - 48 i. *Equipment Name* represents the name of any equipment, system, material or finish as
 - 49 designated in the Contract Documents.
 - 50 ii. *What* represents what the file is about
 - 51 iii. *BARTILLON HOMELESS SHELTER* represents the title of the project or contract. A
 - 52 shortened version of the title may be identified by the City Project Manager to be used by
 - 53 all contractors.
 - 54 iv. *Contract number* is the specific identification number the Work was bid under and appears
 - 55 on the plan set title sheet and in each sheet title block
 - 56 v. *Year* represents the year the contract will be closed out

- 1 b. Examples of file names
 2 i. AHU 2_Operation Manual_Fire Admin_1234_2015
 3 ii. CPT 2_Use and Care_MPD West_9876_2011
 4 C. All contractors shall submit the completed digital PDF files to the GC in sufficient time for the GC to meet the
 5 O&M Data submission deadlines as described in Specification Section 01 29 76, Progress Payment Procedures.
 6 D. O&M Data shall be submitted and reviewed as described in sections 3.2 and 3.3 below.
 7

8 **3.2. O&M DATA DRAFT SUBMITTAL**

- 9 A. All contractors shall prepare and submit the following for an O&M Data Draft review submittal:
 10 1. Prepare three (3) complete O&M Data file samples as described in section 3.1 above.
 11 2. Review all specifications within their Division of Work and prepare a complete O&M Data checklist listing
 12 all equipment, systems, materials, or finishes. Checklist shall be in tabular form similar to the example
 13 below and shall indicate the title (and plan identifier when applicable) of the O&M Data, the associated
 14 specification, and a column to verify the item has been turned in and completed.
 15 B. The GC shall be required to review all contractors’ samples and checklists for compliance with this specification
 16 and shall return any to the originating contractor that are insufficient for re-submittal.
 17 1. When acceptable to the GC, they shall upload each O&M Data draft submittal file to the O&M Draft
 18 library on the Project Management Web Site.
 19 C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the
 20 O&M Data draft submittals and checklist within fifteen (15) working days as follows:
 21 1. Provide general critique comments by Division on O&M Data samples submitted. Critique is intended to
 22 provide all contractors with information on strengths and weaknesses of their submittals.
 23 a. Re-submittal of the O&M Data samples will not be required.
 24 2. Review in detail the O&M Data Checklist for completeness. Provide comments as needed.
 25 a. Re-submittal of the O&M Checklist will be required until accepted.
 26

<u>Title</u>	<u>Specification</u>	<u>Completed</u>
Overhead Door Operator	08 36 00	
Air Handling Unit (AHU-3)	23 00 00	
Water Heater (WH-1)	22 30 00	

27
 28 **3.3. O&M DATA FINAL SUBMITTAL**

- 29 A. All contractors shall prepare and submit the following for an O&M Data Final review submittal:
 30 1. Prepare complete O&M Data files as described in Section 3.1 above according to their approved checklist
 31 as described in Section 3.2 above.
 32 2. Submit completed checklist and all final O&M Data files to the GC for final submittal review.
 33 B. The GC shall be required to spot check all contractors’ submittals for completeness against their checklists and
 34 for compliance with this specification and shall return any to the originating contractor that are insufficient for
 35 re-submittal.
 36 1. When acceptable to the GC, they shall upload each O&M Data final submittal file to the O&M Final library
 37 on the Project Management Web Site.
 38 C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the
 39 O&M Data final submittals and checklist within fifteen (15) working days as follows:
 40 1. Review the files submitted against the checklist and request any missing files through the GC.
 41 2. Review in detail all of the O&M Data files for completeness.
 42 a. Submittals shall be accepted or rejected as individual PDF files.
 43 b. Contractors shall re-submit entire O&M submittal if any portion is rejected or incomplete.
 44

45 **3.4. CONSTRUCTION CLOSEOUT**

- 46 A. All contractors shall review Specification 01 77 00, Closeout Procedures and Specification 01 79 00
 47 Demonstration and Training.
 48 1. Acceptance of all final O&M Data submittals is required prior to scheduling Demonstration and Training
 49 Sessions.
 50 2. Completion of all Demonstration and Training Sessions is required to receive the Substantial Compliance
 51 for Occupancy Certificate, and to begin Construction Closeout procedures.
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END OF SECTION

**SECTION 01 78 36
 WARRANTIES**

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 16

PART 1 – GENERAL

1.1. SUMMARY

- 19
 20 A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing all
 21 Warranties and Guarantees related to the Work, workmanship, materials, equipment, and other such items
 22 required by the Construction Documents.
 23 B. Manufacturers’ disclaimers and limitations on product warranties do not relieve any contractor of the warranty
 24 on the Work that includes the product.
 25 C. Manufacturers’ disclaimers and limitations on product warranties do not relieve suppliers, manufacturers and
 26 any contractor required to provide special warranties under the contract documents.
 27

1.2. RELATED SPECIFICATIONS

- 28
 29 A. Section 01 29 76 Progress Payment Procedures
 30 B. Section 01 31 23 Project Management Web Site
 31 C. Section 01 77 00 Closeout Procedures
 32 D. Section 01 78 23 Operation and Maintenance Data
 33 E. Section 01 91 00 Commissioning
 34 F. Other Divisions and Specifications that may address more specifically the requirements for Warranties related to
 35 the installation of all items and equipment installed under the execution of the Work.
 36

1.3. DEFINITIONS

- 37
 38 A. See specification 01 77 00 for the definitions of the following terms that may also be used in this specification:
 39 1. Substantial Compliance
 40 2. Certificate of Occupancy
 41 3. Certificate of Substantial Completion
 42 4. Construction Closeout
 43 5. Contract Closeout
 44 B. Emergency Repair: The Owner or Owner Representative reserves the right to make emergency repairs as
 45 required to keep equipment or materials in operation or to prevent damage to property and injury to persons
 46 without voiding the contractors warranty or bond or relieving the contractor of their responsibilities during the
 47 warranty period.
 48 C. Installer: The company or contractor hired to install a finished product that was manufactured and supplied
 49 specifically for the Work within this contract. The Installer may or may not be the same company that supplied
 50 the product. See the definition for supplier.
 51 D. Supplier: Any company that makes a specific finished product for the Work from information within the Contract
 52 Documents. Examples of suppliers would include custom cabinets, steel stairs and railings, etc. A supplier would
 53 not be a company that distributes items manufactured by others such as an electrical or plumbing supplier.
 54 E. Warranty: A written guarantee from the manufacturer to the owner on the integrity of a product and its
 55 installation, and the manufacturers’ responsibility to repair or replace the defective product or components
 56 within a specified time from the date of ownership. Warranty may also be used interchangeably with
 57 Guarantee. The following warranty types may be part of any specification within the Work associated with the
 58 Construction Documents:

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1. Expressed Warranty: A warranty that provides specific repair or replacement for covered components of a product over a specified length of time.
 2. Implied Warranty: A warranty that is not stated explicitly by a seller or manufacturer that the product is merchantable and fit for the intended purpose.
 3. Standard Product Warranty: Preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner. Standard warranties may be for any amount of time but shall not be for anything less than one (1) year from the warranty date.
 4. Special Warranty: A written warranty required by the Contract Documents either to extend the time limit provided under a standard warranty or to provide greater rights to the Owner.
- F. Warranty Date: The effective date that begins all warranty periods required for products, installations, and work-manship associated with the execution of the Work for this contract. The Warranty Date shall be set by the CPM.
- G. Related Damages and Losses: When correcting failed or damaged Warranted Work, remove and reinstall (or replace if necessary) the construction that has been damaged as a result of the failure or the construction that must be removed and replaced to obtain access for the correction of Warranted Work.
- H. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected reinstate the warranty by a new written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation unless specifically noted otherwise in a specification.
- I. Replacement Cost: All costs that may be associated with Work being replaced under warranty including but not limited to the following:
1. Related damages and losses
 2. Labor, material and equipment
 3. Permits and inspection fees
 4. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its anticipated useful service life.
- J. Replacement Work: All materials, products, required labor, and equipment necessary to replace failed or damaged warranted to an acceptable condition that complies with the requirements of the original Construction Documents.
- K. Owners Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, and remedies.
1. Rejection of Warranties: The Owner reserves the right to reject any warranty and to limit the selection of products with warranties not in conflict with the requirements of the contract documents.
 2. Where the Contract Documents require a Special Warranty or similar commitment on the Work or product, the Owner reserves the right to refuse acceptance of the Work until the Contractor presents evidence the entities required to countersign such required commitments have done so.

1.4. GENERAL CONTRACTORS RESPONSIBILITIES

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- A. The General Contractor (GC) shall be responsible to remedy, at their expense, any defect in the Work and any damage to City owned or controlled real or personal property when the damage is a result of:
1. The GC's failure to conform to Contract Document requirements.
 - a. Any substitutions not properly approved and authorized may be considered defective.
 2. Any defect in workmanship, materials, equipment, or design furnished by the GC or Sub-contractors.
- B. All warranties as described in this specification and these Contract Documents shall take effect on the date established by the CPM, as noted in Section 1.3F above.
1. All warranties shall remain in effect for one (1) year thereafter unless specifically stated otherwise in the Contract Documents or where standard manufacturer warranties are greater.
- C. The GC's warranty with respect to Work repaired or replaced, including restored or replaced Work due to damage, will run for one (1) year from the date of Owner Acceptance of said repair or replacement.
1. This shall be regardless of any benefit the Owner may have had from the Work through any portion of its anticipated useful service life.
- D. Warranty Response
1. See Section 3.5 of this specification.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. WARRANTY CHECKLIST

- A. All contractors shall be responsible for reviewing the drawings and specifications within their Divisions of Work to provide a complete and comprehensive list of all Warranty Requirements to the GC.
- B. Each list shall indicate the title (and plan identifier when applicable) of the warranted item, the associated specification of the warranted item, the terms of the warranty (years), and a column to verify the item has been turned in and completed.
- C. The GC shall be responsible for all of the following:
 - 1. Consolidating all the warranty lists into one master Warranty Checklist.
 - a. The checklist shall be in a tabular data format similar to the sample below.
 - 2. Upload the completed checklist to the Submittal Library on the Project Management Web Site for review. See Specification 01 33 23 Submittals for more information on this procedure.
 - 3. Resubmit the schedule as needed after initial reviews have been completed.
- D. The GC shall work with all contractors to amend the Warranty Checklist throughout the execution of the project based on changes and modifications as necessary.

<u>Title</u>	<u>Specification</u>	<u>Terms</u>	<u>Completed</u>
Overhead Door Operator	08 36 00	MFR 2yr	
Exterior Bench and Trash Receptacles	12 93 00	MFR 3 year warranty on finish	
Kitchen Sink (SK-1)	22 42 00	MFR 5 year	
Disposal (D-1)	22 42 00	MFR 7 year parts and in-home service	
Toilet (WC-1)	22 42 00	MFR 1 year limited	

3.2. LETTERS OF WARRANTY

- A. All letters of warranty shall be in a typed letter format and provide the following information:
 - 1. The letter shall be on official company stationary including company name, address, and phone number.
 - 2. Indicate BARTILLON HOMELESS SHELTER, contract number, and contract address the warranty is for on the reference line.
 - 3. Provide a description of the warranty(ies) being provided.
 - a. Include Division, Trade, or Specification information as necessary.
 - b. Only combine warranties of related Divisional Work together. Create new letters for additional Divisions as necessary.
 - 4. Indicate the effective Warranty Date. As noted in Section 1.3.F above, the Warranty Date shall be the date the Certificate of Substantial Completion was signed by the City Engineer.
 - 5. Contractor Letters of Warranty shall only be signed by a principal officer of the company.
 - 6. After signing the letter provide the GC with a high quality color scanned image in PDF format and the original signed letter.
- B. The GC shall be responsible for the Final Warranty submittal as identified in Section 3.4 below.
- C. The GC shall obtain letters of warranty from all of the following:
 - 1. The General Contractor shall provide warranty letters for all Work that was self performed under the contract documents, identify all trades or Divisions of Work.
 - 2. All Sub-contractors shall provide warranty letters for Work performed under the contract documents; identify all trades or Divisions of Work.
 - 3. Suppliers, as required by other specifications within the Construction Documents where the manufacture of a specific product unique to the Work of this contract was required.
 - a. The terms and conditions of the Supplier Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair, or replace defective materials and workmanship within one (1) year of the warranty date.
 - b. When the supplier is also the installer a single written letter may be submitted identifying both the warranty for the manufacture of the product and the warranty for the installation of the product.
 - 4. Installers as required by other specifications within the Construction Documents where the installation of a specific product unique to the Work of this contract was required.

1. The terms and conditions of the Installer Letter of Warranty shall be as defined by the specifications associated with the Work but shall not be less than the industry standard of repair, or replace defective materials and workmanship associated with the installation of the product within one (1) year of the warranty date.
5. Special Letters of Warranty shall be required from any contractor, supplier, installer or manufacturer who agrees to provide warranty services required by any Division Specification in excess of their Standard Product Warranty.

3.3. STANDARD PRODUCT WARRANTY

- A. All contractors shall be responsible for collecting and providing copies of all standard product warranties for commercially available products purchased and installed under this contract.
- B. Only one copy of the manufacturers' standard warranty needs to be submitted as representative for all quantities of the same model number used throughout the Work.
- C. Provide the manufacturers certificate, letter, or other standard documentation for each Standard Product Warranty submitted as follows:
 1. Whenever possible a PDF version of the document shall be used.
 - a. If a PDF version is used all additional information shall be completed using simple PDF editing tools such as text boxes, highlight, etc.
 - b. If a PDF version is not available and an original document is furnished the additional information shall be neatly hand written and highlighted on the document in such a fashion so that it does not obscure any part of the written warranty.
 2. Provide the following additional information on each warranty document:
 - a. Contract warranty date.
 - b. Provide the manufacturer name and model number of the product if not specified within the warranty.
 - i. Where the manufacturer name and model number is specified within the warranty it shall be highlighted for visibility.
 - c. Provide the plan identifier (LAV-1, WC-2, etc) when applicable.
- D. Each completed warranty shall be saved as a digital PDF. The file shall be named using the specification number and item description. I.E. 22 42 00 Toilet (WC-1).pdf
 - a. Where an original certificate was furnished provide a high quality colored scan of the completed document with the additional information. Save the scanned image in PDF format and use the same naming convention as indicated above.
- E. Provide all PDF files and any original documents to the GC for final consolidation to be provided to the Owner.

3.4. FINAL WARRANTY SUBMITTAL

- A. The GC shall receive all required warranties (digital PDF and any original documents) from all contractors, suppliers, installers and manufacturers.
- B. The GC shall inventory all received warranties with the Warranty Submittal List to ensure all required warranties have been received and all warranty periods are correct according to the specifications.
- C. Provide with each Operation and Maintenance Manual a complete copy of any associated warranty.
- D. Scan all warranties into a single organized electronic PDF file as follows:
 1. Organize the PDF file into an orderly sequence based on the table of contents of the Specifications.
 2. Provide a typed Table of Contents for the entire file at the front of the document.
 3. Provide bookmarks and links to each individual PDF to enable quick navigation through the PDF document.
- E. Upload the warranty submittal to the appropriate document library on the Project Management Web Site for review by the Project Architect (PA)/Project Engineer (PE) and CPM.
- F. Correct any deficiencies or omissions and resubmit as necessary.

3.5. WARRANTY NOTIFICATION, RESPONSE, EXECUTION AND FOLLOW-UP

- A. Warranty Notification:
 1. The City of Madison, Project Management Web Site, uses an email notification system for all warranty related issues. The GC will be required to provide, and keep current during the warranty period, a minimum of two (2) email addresses and phone numbers of current employees to receive email notifications and provide response regarding Work associated with these construction documents.
 - a. In the event a Warranty Issue is deemed by the City of Madison to be an emergency, the GC shall first receive a phone call with a follow-up email from the Project Management Web Site.

- 1 b. The Contract Closeout-Warranty Issue Library on the Project Management Web Site uses a form
2 for each warranty issue that is logged into the system.
- 3 i. The GC shall open each warranty issue form, review the issue description and any attached
4 documentation or photos.
- 5 ii. The GC shall also notify any other sub-contractor, supplier, or installer that may be
6 required to review the warranty issue.
- 7 B. Warranty Response:
- 8 1. The GC shall upon notification by the City of Madison provide warranty response as follows:
- 9 a. Critical Systems or equipment: Where damage to equipment and other building components, or
10 injury to personnel is probable provide immediate emergency shut-down information and an on-
11 site response team as soon as possible but in no case shall on-site response exceed 24 hours.
- 12 b. For non-critical responses where damage or injury is unlikely provide on-site response no later
13 than the next business day.
- 14 c. Where Technical Assistance support is part of the written warranty provide all assistance
15 necessary via phone, text, or internet systems as indicated by the warranty. If issues cannot be
16 resolved provide on-site response no later than the next business day.
- 17 d. If the request cannot be supported in sufficient time as outlined above the Owner (or Owner
18 Representative) reserves the right to contact other contractors or service companies having
19 similar capability to expedite the repair or replacement and shall invoice all associated costs to
20 the Owner back to the GC.
- 21 C. Warranty Execution:
- 22 1. The GC shall provide all repairs or replacements as necessary to restore broken or damaged Work to the
23 original level of acceptance as intended by the Contract Documents.
- 24 a. Provide all materials, equipment, products, and labor necessary to complete the repair or
25 replacement associated with the Warranty Issue.
- 26 b. Provide all cleaning services as may be required before, during, and after the repair or
27 replacement as per Specification 01 74 13 Progress Cleaning.
- 28 c. Provide any protection necessary for existing construction as per Specification 01 76 00 Protecting
29 Installed Construction
- 30 d. Provide new letters of warranty when required.
- 31 D. Warranty Follow-up:
- 32 1. Logged Warranty Issues:
- 33 a. The GC shall provide complete documented responses of all logged Warranty Issues. Responses
34 shall provide a description of work completed, by who, inclusive dates, and photos of completed
35 or repaired work.
- 36 i. Provide call back response if work is not acceptable.
- 37 b. The City Project Manager shall review the submitted response documentation and do a field
38 inspection if necessary.
- 39 i. If work is not acceptable, contact GC to review details and expectations of the repair as
40 needed.
- 41 ii. If work is acceptable close the Warranty Issue.
- 42 2. Quarterly Warranty Reviews:
- 43 a. The GC shall be responsible for scheduling quarterly on-site review with all of the following:
- 44 i. City Project Manager, and other City staff as needed
- 45 ii. Owner and Owner Tenant Representative
- 46 iii. Commissioning Agent (CxA)
- 47 iv. Plumbing, Heating, Electrical Sub-contractors
- 48 v. Other Sub-contractors that may be responsible for open Warranty issues
- 49 b. Quarterly reviews shall be scheduled at 3 months, 6 months, and 11 months after the effective
50 date of the warranty. The review meetings shall:
- 51 i. Review the status of all open Warranty Issues, determine course of action and estimated
52 date of completion.
- 53 ii. In the appropriate quarter, provide shut-down, start-up, testing, and training of off-season
54 equipment as required by the contract documents.
- 55 iii. The 11th month review shall review all open Warranty Issues, final plan for resolution, and
56 all Warranty Issues where a new letter of warranty may have been issued.
- 57
- 58

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END OF SECTION

**SECTION 01 78 39
AS-BUILT DRAWINGS**

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PART 1 – GENERAL

1.1. SUMMARY

- 22 A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they
23 pertain to City of Madison contract procedures regarding the accurate recording of the Work associated with the
24 execution of this contract. This shall include but not be limited to work that will be hidden, concealed, or buried.
25 B. Each contractor shall be responsible for maintaining an accurate record of all installations, locations, and
26 changes to the contract documents during the execution of this contract as it may relate to their specific division
27 or trade.
28 C. The General Contractor (GC) shall be responsible for ensuring all contractors provide as-built record information
29 to the Master As-Built Document Set as described in this specification.
30

1.2. RELATED SPECIFICAITONS

- 32 A. 00 31 21 Survey Information
33 B. 01 26 13 Request for Information
34 C. 01 31 23 Construction Bulletin
35 D. 01 32 33 Photographic Documentation
36 E. 01 26 63 Change Orders
37 F. 01 29 76 Progress Payment Procedures
38 G. 01 31 23 Project Management Web Site
39 H. 01 33 23 Submittals
40 I. 01 77 00 Closeout Procedures
41 J. 01 91 00 Commissioning
42 K. Other Divisions and Specifications that may address more specifically the requirements for field recording the
43 installation of all items associated with the execution of this contract by Division or Trade.
44

1.3. RELATED DOCUMENTS

- 46 A. Other related documents shall include but not be limited to the following:
47 1. Bidding documents including drawings, specifications, and addenda.
48 2. Required regulatory documents of conditional approval.
49 3. Field orders, verbal or written by inspectors having regulatory jurisdiction.
50 4. Shop drawings and installation drawings.
51

1.4. PERFORMANCE REQUIREMENTS

- 53 A. The GC shall be responsible for maintaining the “Master As-Built Document Set” in the job trailer at all times
54 during the execution of this contract. This document set shall include all of the following:
55 1. Master As-Built Plan Set
56 2. Master As-Built Specification Set
57 3. Other Document Sets

- 1 B. The GC shall designate one person of the GC staff to be responsible for maintaining the Master As-Built
2 Document Set at the job trailer. This shall include, posting updates, revisions, deletions and the monitoring of all
3 contractors posting as-built information as described in this specification.
4 C. All contractors shall use this specification as a general guideline regarding the requirements for documenting
5 their completed Work. Contractors shall explicitly follow additional specification requirements within their own
6 Division of Trade as it may apply to this specification.
7

8 **1.5. QUALITY ASSURANCE**

- 9 A. The GC shall be responsible for all of the following:
10 a. Spot checking all sub-contractors field documents to insure daily information is being recorded as
11 work progresses.
12 b. Discuss as-built recording to the plan set at weekly job meetings with all sub-contractors on site.
13 c. Schedule time with sub-contractors in the job trailer for recording as-built information to the plan
14 set.
15 d. Insure that all sub-contractors are providing clear and accurate information to the plan set in a
16 neat and organized manner.
17 e. Insure sub-contractors who have completed work have finalized recording all as-built information
18 to the plan set before releasing them from the project site.
19 B. The Project Architect, the City Project Manager, Commissioning Agent and other design team staff will perform
20 random checks of the Master As-Built Document Set during the execution of this contract to ensure as-built
21 information is being recorded in a timely fashion as the Work progresses. An updated and current Master As-
22 Built Document Set is a stipulation for approval of the progress payment.
23

24 **PART 2 – PRODUCTS**

25
26 **2.1. OFFICE SUPPLIES**

- 27 A. The GC shall provide a sufficient supply of office products in the job trailer at all times for all contractors to use in
28 recording as-built information into the plan set. This shall include but not be limited to the following:
29 a. Red ink pens, medium point. Pens that bleed through paper, markers, and felt tips will not be
30 accepted.
31 b. The use of highlighters is acceptable. Assign colors to various trades for consistency in recording
32 information.
33 c. Straight edges of various lengths for drawing dimension, extension and other lines.
34 d. Civil and Architectural scales
35 e. Clear transparent, non-yellowing, single sided tape.
36 f. Correction tape or correction fluid for correcting small errors.
37

38 **PART 3 - EXECUTION**

39
40 **3.1. FIELD DOCUMENT AS-BUILTS**

- 41 A. The GC and all Sub-contractors shall be responsible for keeping their own field set of as-built documents
42 including plans, specifications and published changes.
43 B. Field sets shall be kept dry and in good condition at all times.
44 C. No Work shall be buried, covered, or hidden, by any additional Work, regardless of Contractor or Trade, until
45 locations of all materials and equipment has been properly documented as described below.
46 D. All contractors shall be required to record the following as-built information:
47 a. Notes on the daily installation of materials and equipment.
48 b. Sketches, corrections, and markups indicating final location, positioning, and arrangement of
49 materials and equipment such as pipes, conduits, valves, cleanouts, pull boxes and other such
50 items. Note all final locations on plan sheets, indicate dimension off identifiable building features.
51 Riser diagrams need only be corrected for significant changes in locations, routing or
52 configuration.
53 i. The use of photographs in lieu of hand drawn sketches is acceptable.
54 ii. Photos shall be taken according to Specification 01 32 33 Photographic Documentation
55 iii. Print photo and markup with dimensions or notes as necessary.
56 c. Identify by the use of existing plan symbology and notes the size, type, quantity, and use as
57 applicable of materials such as pipes, valves, conduits, etc.

- 1 d. Note whether horizontal runs are below slab or above ceiling, include dimensions above or below
2 finished floor elevation.
3 E. All contractors shall be responsible for transferring the information from their field set of documents to the
4 Master As-Built Plan Set kept in the GC job trailer. See Section 3.3.D. below for the proper procedure.
5 F. All contractors shall update the GC Master Plan Set as often as necessary, but not less than once per work week.
6

7 **3.2. SITE SURVEY AS-BUILT**

- 8 A. The Land Surveyor Sub-Contractor shall provide digital as-built information including but not be limited to the
9 following:
10 a. For underground buried utility laterals and services of all types locate all of the following that may
11 apply:
12 i. Connection points at all mains
13 ii. Storm discharge points to open air
14 iii. All corners and bends regardless of angle, large radius sweeps shall have multiple point
15 locations sufficient to define the sweep.
16 iv. All vertical drops
17 v. All wells
18 vi. Private buried utilities such as buried electrical cables, irrigation systems, etc.
19 v. Other information that may need to be located in the future by the owner prior to digging
20 b. Record all surface features including but not limited to the following:
21 i. Building corners, pavement edges, and other permanent structural features.
22 ii. All surface covers for inlets, catch basins, cleanouts, access structures, curb stops and
23 other such devices.
24 iii. Other permanent surface features such as hydrants, lamp posts, and other permanent site
25 amenities.
26 c. The following data shall be recorded while locating items in sub-sections 3.2.a and 3.2.b above:
27 i. Flow lines at both ends of pipes
28 ii. Pipe sizes and material types
29 iii. Rim elevations for all covers
30 iv. Sump elevations and invert elevations of all structures
31 v. Spot elevations for all pads, driveways, walks, stoops, and floors
32 B. The Surveyor shall provide the final digital as-built on a media and in a format specified in Specification 00 31 21
33 Survey Information to the GC for turn in to the Project Architect and the Civil Engineer.
34 C. The Surveyor shall provide two printed as-built site plans to the GC for inclusion in the Master As-Built Plan Set
35 as follows:
36 1. One sheet to show all features (but not contour information) with text neatly organized for each item
37 identified.
38 2. One sheet showing contours, contour labels, and features from item 1 above, but with no additional text.
39

40 **3.3. MASTER AS-BUILT DOCUMENT SET**

- 41 A. The GC shall be responsible for maintaining the Master As-Built Document Set in the job trailer at all times.
42 1. The Master As-Built Plan Set (Plan Set) shall begin with one complete bid set of drawings and any
43 additional sheets that were supplied by published addenda during the bidding process. The cover sheet
44 shall be titled as the “Master As-Built Plan Set” in large bold red letters approximately 2” in height and
45 shall not be used for any other purpose.
46 a. The Plan Set shall be kept dry, legible, and in good condition at all times.
47 b. The Plan Set shall be kept up to date with new revisions within two (2) working days of
48 supplemental drawings being issued. Revisions shall be posted as follows:
49 i. Insert new, revised sheets into the plan set. Void old sheets but do not remove them from
50 the plan set. Indicate date received and what document (RFI, CB, CO, etc) caused the
51 change.
52 ii. Insert new, revised individual details into the plan set. Void old details, tape new details
53 over the old details with a “tape hinge” to allow them to be viewed. Indicate date
54 received and what document (RFI, CB, CO, etc) caused the change.
55 iii. Add new details in appropriate white space on relevant sheets. If no space is available use
56 the back side of the previous sheet or insert a new sheet. Indicate date received and what
57 document (RFI, CB, CO, etc) caused the change.

- 1 c. The Plan Set shall be available at anytime for easy reference during progress meetings and for
2 emergency location information of new work already completed.
- 3 2. The Master As-Built Specification Set (Spec Set) shall begin with one complete bid set of specifications
4 and any additional specifications that were supplied by published addenda during the bidding process.
5 The Spec Set shall be provided in three "D" ring type binders of sufficient thickness to accommodate the
6 specification set. Multiple binders are allowed as necessary. Label the front cover and binding edge with
7 "Master As-Built Specifications" in bold red letters. Provide other information as necessary to distinguish
8 the contents of multi-volume sets.
- 9 a. The Spec Set shall be kept dry, legible, and in good condition at all times.
10 b. The Spec Set shall be kept up to date with new revisions within two (2) working days of
11 supplemental drawings being issued.
- 12 c. The Spec Set shall be available at anytime for easy reference during progress meetings.
- 13 3. Other Document Sets may be kept at the GCs option in three "D" ring type binders of sufficient thickness
14 to accommodate the documentation. Other documentation sets may include but not be limited to RFIs,
15 CBs, COs, etc.
- 16 C. The Land Surveyor Sub-Contractor shall be required to use digital surveying for all exterior site surveying, and
17 provide deliverable digital as-builts as specified in Specification 00 31 21 Survey Information. As soon as practical
18 the surveyor shall provide the GC with a preliminary copy of installed buried utilities for inclusion with the plan
19 set in the job trailer. The surveyor shall provide final digital as builts as per section 3.2 above.
- 20 D. All contractors shall be responsible for updating the Plan Set from their field sets at least once per work week.
21 Updates shall include but not be limited to the following procedures:
- 22 a. All updates shall be done only in red ink. Place a "cloud" around small areas of correction to call
23 attention to the change.
- 24 b. Whenever possible place general work notes, field sketches, supplemental details, photos, and
25 other such information on the reverse side of the preceding sheet. Installation notes including
26 dates shall be kept neatly organized in chronological order as necessary.
- 27 c. Accurately locate items on the plan set as follows:
- 28 i. For items that are located as dimensioned provide a check mark or circle indicating the
29 dimension was verified.
- 30 ii. For items that are within 5 feet of the location indicated on the plans leave as shown and:
- 31 • Provide correct dimensions to existing dimension strings or,
32 • Accurately locate with new dimension strings
- 33 iii. For items that are more than 5 feet from the location indicated on the plans
- 34 • Accurately draw the items in the new location as installed and,
35 • Accurately locate with new dimension strings and,
36 • Note that the existing location is void.
- 37 d. Include dimensioned locations for items that will be buried, concealed, or hidden in the ground,
38 under floors, in walls or above ceilings.
- 39 i. Dimensions shall be pulled from identifiable building features, not from centers of columns
40 or other buried features.
- 41 ii. When necessary pull more dimensions as needed from opposing directions to properly
42 locate single items.

3.4. AS-BUILT REVIEW AND ACCEPTANCE

- 45 A. The GC shall provide the Master As-Built Plan Set to the Project Architect (PA)/Project Engineer (PE), the City
46 Project Manager (CPM), the Commissioning Agent (CxA) and other design team staff for content review prior to
47 the Progress Payment Milestone indicated in Specification 01 29 76 Progress Payment Procedures. The
48 submitted plan set shall include the digital survey information produced under Section 3.2 above.
- 49 1. If the plan set is not approved:
- 50 a. The PA/PE and CPM shall only be required to generalize deficiencies by trade there shall be no
51 requirement or expectation to generate a "punch list" of required corrections.
- 52 b. The GC and Sub-contractors as necessary shall be responsible for inspecting the installation and
53 correcting the drawings as needed.
- 54 c. The GC shall re-submit the plan set for review.
- 55 2. If the plan set is approved the PA/PE shall take possession of the plan set to be used in providing the
56 owner with digital CAD record drawings. Upon completion of transferring the information to CAD the
57 PA/PE shall provide the Owner with CAD record drawings, record PDFs, and the Master As-Built Plan Set.
58

- 1 **3.5. CHANGES AFTER ACCEPTANCE**
- 2 A. No Contractor shall be responsible for making changes to the As-Built record documents after acceptance by the
- 3 PA/PE and CPM except when necessitated by changes resulting from any Work made by the Contractor as part
- 4 of their guarantee.
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**SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS**

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PART 1 – GENERAL

1.1. SUMMARY

- 21 A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they
22 pertain to City of Madison contract procedures regarding spare parts, special tools, special materials, and extra
23 materials.
24 B. Each contractor shall be responsible for knowing the specific requirements of their Division Specifications as they
25 may relate to the general information provided in this specification.
26 C. The General Contractor (GC) shall be responsible for ensuring all contractors provide spare parts and extra
27 materials as described in this specification.
28

1.2. RELATED SPECIFICAITONS

- 29
30 A. 01 29 76 Progress Payment Procedures
31 B. 01 31 23 Project Management Web Site
32 C. 01 77 00 Closeout Procedures
33 D. Other Divisions and Specifications that may address more specifically how to proceed with spare parts, special
34 tools, special materials, and extra materials.
35

1.3. DEFINITIONS

- 36
37 A. Spare Parts: Any component of a product or assembly that comes pre-packaged or was specially ordered for the
38 explicit use of the product or assembly. This shall include but not be limited to fastening devices, mounting
39 brackets, replacement parts, wheels, pulleys, wiring, alternate assembly pieces, etc.
40 B. Special Tools: Any tool of any kind that was pre-packaged or specially ordered, and is required to be used for the
41 installation or maintenance of an installed product or assembly as part of this contract.
42 C. Special Materials: Any oil, lubricant, glue, touch-up paint, or other such material that comes pre-packaged or
43 was specially ordered and is required to be used for the installation or maintenance of an installed product or
44 assembly as part of this contract.
45 D. Extra Materials (Attic Stock): Any surplus materials in new and useable condition that was installed a part of this
46 contract. Attic Stock shall include but not be limited to the following: ceiling tiles, paint, stain, floor coverings,
47 ceramic tiles, light bulbs/lamps, filters, strainers, etc. Attic Stock shall include partially opened bulk items and
48 additional unopened quantities as directed by other specifications.
49

1.4. PERFORMANCE REQUIREMENTS

- 50
51 A. All contractors shall be responsible for consolidating spare parts, special tools, special materials, and attic stock
52 as it pertains to the specific Work within their Division or Trade.
53 B. All contractors shall use this specification as a general guideline regarding the requirements for turning spare
54 parts, special tools, special materials, and attic stock over to the owner. Contractors shall explicitly follow
55 specification requirements within their own Division of Trade.
56

1.5. QUALITY ASSURANCE

- 57
58 A. The General Contractor (GC) shall be responsible for all of the following:

1. Coordinate the location for and the delivery of all spare parts, special tools, special materials, and attic stock being provided by all contractors under this contract to one centralized location as designated by the Owner.
2. Verify that all items being delivered are:
 - a. Clean, new, and in a usable condition.
 - b. Properly sealed, protected, and labeled
 - c. Properly documented

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. PACKAGING

- A. Whenever possible all surplus items should remain in their original packaging such as parts envelopes.
- B. Package small parts in re-sealable plastic bags (Ziploc) or envelopes with clasp fasteners. Do not use envelopes that seal with glue or tape envelopes closed. Do not leave packaging unsealed.
- C. Package like parts together for products or assemblies. I.E. keep all spare parts for flushometers together.
- D. Many small packages may be grouped together into a larger container by trade.
- E. Do not use unrelated boxes or containers for packaging spare items. I.E. do not use a light fixture box for spare breakers, or flushometers parts.

3.2. LABELING

- A. Whenever possible the original labeling indicating part numbers and other pertinent information shall remain on the original packaging.
- B. If original labeling is not available the contractor shall label all parts and packages using tape or labels and permanent black markers. Tape or labels being used shall absorb the permanent marker without bleeding or allowing ink to be smeared or rubbed off.
- C. Labels shall include the name of the product or equipment the item belongs to, part number and/or name, and any other information that would assist maintenance personnel in identifying the piece and related product.
- D. Labels shall include plan or specification designations (WC-1, LAV-3, DF-2, CPT-1, etc) that identify the particular product or finish material it represents.
- E. Labels for parts stored in clear re-sealable plastic bags may be placed inside the bag. Label shall face out and be able to be read from one side. Multiple bags shall be numbered individually for identification.
- F. Label the outside of large containers with the trade name (Plumbing, Electrical, etc).

3.3. INVENTORY

- A. All contractors shall provide the GC with complete inventories of all spare parts, special tools, special materials, and attic stock that they are providing at the end of the contract. The inventories shall be organized as follows:
 1. The cover sheet shall indicate the Contractors name, address, phone number, identify that the document is the "Spare Parts and Extra Materials Inventory", and identify the Division or Trade the inventory is for.
 2. Provide an inventory in a tabular format of all items being provided under this and other specifications. The minimum information to be provided for each item on the inventory shall be as follows:
 - a. Bag or container number, all items of one bag or container shall be grouped together on the inventory
 - b. Item description
 - c. Item size (if applicable)
 - d. Total quantity provided
 - e. Identify if item is a spare part, tool, special material, or attic stock
- B. The GC shall consolidate inventories from all sub-contractors into one tabular data sheet organized by Division or Trade of Work.
 1. Upon completing the consolidated list the GC shall upload the completed inventory to the Contract Closeout-Attic Stock Library on the Project Management Web Site.
 2. The GC shall notify the Project Architect and City Project Manager that the scans have been uploaded.
 3. Consulting Staff and Owner Staff shall review the inventories prior to Final Review to verify that minimum required quantities have been met. Deficiencies shall be noted and returned back to the GC for corrective action.

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3.4. STORAGE

- A. Prior to the 80% Progress Payment milestone the GC shall coordinate with the City Project Manager and Maintenance Personnel where spare parts, special tools, special materials, and attic stock shall be stored.
- B. The GC shall instruct all contractors as to the location and proper storage procedures.
- C. The GC shall be responsible for ensuring the storage area is kept neat and orderly as follows:
 - 1. Like items are stored together by material, product, or trade as necessary.
 - 2. Liquids are stored in sealable containers and the lids have been properly installed to prevent drying out, spillage, etc.
 - 3. All labels are clearly visible and provide the required information.
- D. Large items shall be stored so as not to damage other items. Do not stack heavy items or items with distinct shapes/outlines on softer items that may get crushed or imprinted.

3.5. CLOSEOUT PROCEDURE

- A. Prior to the 90% Progress Payment milestone the GC shall review all attic stock already stored by the contractors to ensure the following:
 - 1. Materials are stored in the proper location(s).
 - 2. All boxes, containers and items are properly labeled according to the submitted/approved inventory.
 - 3. Quantities are correct according to the submitted/approved inventory.
- B. The GC shall ensure that all deficiencies are corrected prior to conducting Demonstration and Training Sessions.
- C. The GC shall review with Maintenance Staff all inventories and labeling during the scheduled Demonstration and Training Sessions.
- D. Any discrepancies associated with Attic Stock shall be resolved and verified prior to the CPM releasing the 90% CT progress payment.

END OF SECTION

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**SECTION 01 79 00
DEMONSTRATION AND TRAINING**

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PART 1 – GENERAL

1.1. SUMMARY

- 19
20 A. The purpose of this specification is to provide clear responsibilities and guidelines related to providing
21 Demonstration and Training (D&T) Sessions related to general facility use, equipment, systems, finishes, and
22 materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and Custodial Personnel) as
23 needed.
24 B. All D&T shall be coordinated through the General Contractor (GC), Project Architect (PA)/Project Engineer (PE)
25 and City Project Manager (CPM), and will be based on or customized to the needs of City of Madison Staff being
26 trained. New equipment and systems may have complete D&T sessions as described in this specification while
27 equipment or systems staff is familiar with may have sessions more focused on maintenance only.
28

1.2. RELATED SPECIFICATIONS

- 29
30 A. Section 01 29 76 Progress Payment Procedures
31 B. Section 01 78 13 Completion and Correction List
32 C. Section 01 78 19 Maintenance Contracts
33 D. Section 01 78 23 Operation and Maintenance Data
34 E. Section 01 78 36 Warranties
35 F. Section 01 78 39 As-Built Drawings
36 G. Section 01 78 43 Spare Parts and Extra Materials
37 H. Section 01 91 00 Commissioning
38 I. Other Divisions and Specifications that may address more specifically the requirements for D&T sessions related
39 to the installation of all items and equipment installed under the execution of the Work.
40

1.3. QUALITY ASSURANCE

- 41
42 A. All contractors shall have the responsibility of preparing for and conducting D&T sessions as determined by this
43 and other Division or Trade related specifications, Owner Operation and Maintenance Manuals, and other such
44 documentation related to the Work.
45 B. The GC shall have responsibility for:
46 1. Ensuring that all contractors required to conduct a D&T session have successfully completed all of the
47 following:
48 a. Turned in all required documentation for review and documentation has been approved/accepted
49 prior to scheduling D&T sessions.
50 b. Other required documentation as needed is available and ready for use during the D&T session.
51 c. All systems have been started, tested, and running as per appropriate specification and/or
52 manufacturers recommendations prior to scheduling D&T sessions.
53 d. All contractors are sufficiently prepared for their D&T session
54 e. Documents the D&T session including date, time, contractor and company name, attendees and
55 other information regarding the session
56 2. Organizing the coordination and scheduling of all D&T sessions between all contractors and the
57 appropriate representatives of the Owner. These representatives may include any of the following
58 depending on the Work of the Contract:

- a. Owner – end users
- b. Facility Maintenance personnel
 - i. Facility general operation procedures including custodial services
 - ii. Electrical
 - iii. Mechanical
 - iv. Plumbing
 - v. Site
- c. Information Technology (IT) Department
- d. Traffic Engineering – Radio Shop
- e. Architects, Engineers and Facility Management staff as project completion overview

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- A. The GC shall develop a specific D&T plan to be scheduled and conducted as described below but no sooner than the meeting discussed in 3.2.A.2 below.
- C. The GC shall not schedule D&T sessions to preclude required personnel from attending multiple sessions.

3.2. COORDINATING AND SCHEDULING THE TRAINING

- A. The GC, PA/PE, CxA and CPM, shall review all Training and Demonstration requirements during two (2) special meetings.
 - 1. The first meeting shall be held at the 50% Contract Total Payment. During this meeting the following shall be discussed:
 - a. Preliminary schedule of training dates to be completed prior to beginning construction closeout.
 - b. List of documentation and items that need to be completed and available before and during the training session.
 - c. Who (Owner, Maintenance, etc) will be attending what training session(s).
 - 2. The second meeting shall be held at the 80% Contract Total Payment. This meeting shall review due outs that have not yet been completed for the 90% Contract Total Payment and the requirements necessary for Construction Closeout. All Demonstration and Training sessions shall be completed prior to receiving the 90% progress payment and beginning Construction Closeout Procedures (see Specification 01 77 00).
 - a. This does not include any requirement associated with off season equipment preparation and/or demonstration and Training Sessions.
- B. All of the Construction Work shall be operationally ready prior to conducting training as follows:
 - 1. All contractors shall have their As-Built Drawing Records available for reviewing locations of system components during training.
 - 2. All final and approved Operations and Maintenance Data shall be completed no less than two (2) full weeks prior to the scheduled training.
 - 3. All systems shall have been started, functionally tested, balanced, and fully operational, and all piping and equipment labeling complete at least two (2) days prior to the scheduled training.
 - a. Seasonal equipment shall not be trained out of season. Contractors having seasonal equipment shall work with the GC and CPM for coordinating additional training sessions as appropriate for seasonal equipment.
- C. Correction list items that prevent a piece of equipment or system from being fully operational for training shall be corrected prior to conducting the training.

3.3. TRAINING OBJECTIVES

- A. For each piece of equipment or system installed train on the following objectives/topics as applicable:
 - 1. System design, concept, and capabilities
 - 2. Review of related contractor as-built drawings
 - 3. Facility walkthrough to identify key components of the system
 - 4. System operation and programming including weekly, monthly, annual test procedures
 - 5. System maintenance requirements
 - 6. System troubleshooting procedures
 - 7. Testing, inspection, and reporting requirements associated with any regulatory requirements
 - 8. Identification of any correction list items still outstanding

- 1 9. Review of system documentation including the following:
- 2 a. Operation and maintenance data
- 3 b. Warranties
- 4 c. Valve charts, tags, and pipe identification markers
- 5 B. For each piece of specialty equipment train on the following objectives/topics as applicable:
- 6 1. Manufacturers operations instructions
- 7 2. Manufacturers use and care instructions
- 8 3. Manufacturers maintenance and troubleshooting instructions
- 9 4. System operation and programming including weekly, monthly, annual test procedures
- 10 5. Identification of any correction list items still outstanding
- 11 6. Review of system documentation including the following:
- 12 a. Operation and maintenance data
- 13 b. Warranties
- 14 C. End User Orientation
- 15 1. Facility walkthrough
- 16 2. Security and emergency features
- 17 3. General facility operation procedures
- 18 D. Facility General Use and Custodial Services – if requested
- 19 1. Facility walkthrough
- 20 2. Security and emergency features
- 21 3. General facility operation procedures
- 22 4. Care and maintenance of specialty items, finishes, etc as requested
- 23 5. Attic stock inventory and material designations
- 24

25 **3.4. DEMONSTRATION AND TRAINING PROGRAM PREPARATION**

- 26 A. Each contractor having a responsibility for providing D&T sessions shall meet with the GC, CPM, and other City
- 27 Staff as needed to review the extent of the Training Objectives in section 3.3 above needed for each piece of
- 28 equipment, system, finish, etc. This meeting shall occur no less than four (4) weeks prior to the anticipated
- 29 training session.
- 30 B. The contractor shall use the information from item 3.4.A above to prepare a formal training program for each
- 31 piece of equipment or system based on the Training Objectives in 3.3 above.
- 32 1. The formal training program shall include the following information:
- 33 a. Session title
- 34 b. List of systems, equipment, use, care, etc to be covered during the session
- 35 c. Provide the following for each systems, equipment, use, care, etc to be covered during the session
- 36 i. Name and affiliation of each instructor to be used. As needed and discretion of the Owner
- 37 the GC to require attendance by the installing technician, installing Contractor and the
- 38 appropriate trade or manufacturer’s representative.
- 39 ii. Qualifications of each instructor to be used. Practical building operation expertise as well
- 40 as in-depth knowledge of all modes of operation of the specific piece of equipment as
- 41 installed in this project is required by the training personnel. If Owner determines training
- 42 was not adequate, the training shall be repeated until acceptable to Owner.
- 43 iii. A checklist of all documentation and system/equipment requirements necessary to
- 44 complete a successful training session and the current status of each
- 45 iv. Any additional documents, training aids, video or other items to be used to complete the
- 46 training
- 47 v. Any special requirements or needs associated with item iv above to complete the training
- 48 d. The intended audience for the training
- 49 e. The approximate duration of each objective or topic to be covered
- 50 2. Submit the completed training program to the GC for review and approval by the PA/PE and CPM.
- 51 C. The PA/PE and CPM shall work with staff as necessary to ensure all points of anticipated training needs have
- 52 been met. The PA/PE and CPM will approve the program as submitted or recommend changes for re-submittal
- 53 as necessary.
- 54

55 **3.5. CONDUCTING A DEMONSTRATION AND TRAINING SESSION**

- 56 A. All contractors shall conduct their required D&T Sessions as follows:
- 57 1. Begin with a classroom session
- 58 a. Provide a sign in sheet indicating all training to be conducted, instructors, etc.

- 1 b. Provide an overview of the training to be conducted including the approximate schedule.
- 2 2. Conduct a general walk-through of the site.
- 3 a. Point out locations of various equipment, valves, charts, and other related items.
- 4 b. Use the Division or Trade As-Built record drawings to indicate locations of hidden or buried items.
- 5 3. Provide a demonstration of general equipment/system operation including using the O&M manual.
- 6 a. Startup and shutdown procedures.
- 7 b. Normal operational levels as depicted by any gauges, software, etc.
- 8 c. Indicate warning devices, signs etc. and demonstrate emergency shut-down procedures.
- 9 4. Provide a demonstration of all owner level maintenance using the O&M manual.
- 10 a. Indicate frequency of maintenance.
- 11 b. Provide and review all spare parts, special tools, and special materials.
- 12 5. Provide and review all spare parts, special tools, special materials, or attic stock as applicable.
- 13 6. While conducting D&T sessions:
- 14 a. Allow hands on training whenever practical.
- 15 b. Answer questions promptly
- 16 c. Repeat demonstrations and procedures as necessary.
- 17 B. Within two (2) working days of completing the D&T session the contractor responsible for the session shall turn-
- 18 in any documentation generated including the sign in roster to the GC.
- 19 C. The GC shall turn over all training documentation to the PA/PE and CPM upon completion of D&T sessions.
- 20 D. Re-schedule any training that has been determined to be inadequate or inappropriate for any reason including
- 21 but not limited to any of the following;
- 22 1. Unqualified instructor
- 23 2. System installation incomplete or untested to the specifications
- 24 3. Equipment failure during demonstration
- 25 4. Un-expected cancellation

26
27 **3.6. CLOSEOUT PROCEDURE**

- 28 A. Prior to receiving the 90% Progress payment the GC shall:
- 29 1. Verify with the PA/PE and CPM that each Demonstration and Training Session was conducted properly
- 30 and according to the submitted plan.
- 31 2. Any required "Off Season" equipment testing, balancing, and Demonstration and Training Sessions have
- 32 been tentatively scheduled with the GC, necessary sub-contractors, instructors and Owner/Owner
- 33 Representatives as necessary.
- 34
- 35

36 **END OF SECTION**

37

SECTION 01 81 13
SUSTAINABLE DESIGN REQUIREMENTS – LEED FOR NEW CONSTRUCTION V4.0

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26
27 **PART 1 – GENERAL**
28

29 **1.1 RELATED DOCUMENTS**

- 30 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01
31 Specification Sections, apply to this Section.
32 B. Comply with Wisconsin Commercial Building Codes/International Building Code (IBC).
33 C. Comply with Americans with Disabilities Architectural Guidelines, and ICC/ANSI A117.1-Latest Edition.
34 D. Comply with USGBC LEED prerequisites and credits shown in the attached checklist for Project to obtain
35 certification based on USGBC’s LEEDv4.0 (and v4.1 for select credits) BD&C: New Construction and Major
36 Renovations Process.
37 E. Refer to attached LEED v4.0 for BD+C: New Construction and Major Renovations checklist, with LEED credits clearly
38 marked yes or no.
39

40 **1.2 SUMMARY**

- 41 A. Project registration and review fees associated with GBCI and leedonline.com are paid by the City.
42 B. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and
43 credits needed for Project to obtain certification based on USGBC’s LEED BD&C: New Construction and Major
44 Renovations Version 4.0 (and v4.1 for select credits.)
45 1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and
46 may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain
47 LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and
48 comparable product requests.
49 2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on
50 Architect's design and other aspects of Project that are not part of the Work of the Contract.
51 3. A copy of the LEED Project checklist is attached at the end of this Section.
52 4. Specific requirements for LEED are included in greater detail in other Sections.
53 5. Some credits are based on version 4.1 of the LEED rating system rather than version 4.0. The credits in
54 question are noted as appropriate in this section and also in the LEED project checklist provided at the
55 end of the section.
56 C. A significant portion of the credits required for certification are the responsibility of the A/E and Owner (design
57 credits). These credits are not explicitly outlined in this specification section, however many aspects of the

1 construction documents reflect intent to document and achieve the design credits. This section documents
2 requirements of the contractor for documenting the construction credits.
3 D. Related Sections: Divisions 01 through 32 Sections for LEED requirements specific to the work of each of these
4 Sections. Requirements may or may not include reference to LEED.
5

6 **1.3 DEFINITIONS**

- 7 A. Albedo (a.k.a. solar reflectance): The ratio of the reflected electromagnetic energy to the incoming
8 electromagnetic energy.
9 B. Emissivity (a.k.a. infrared emittance): A parameter between 0 and 1 that indicates the ability of a material to shed
10 infrared radiation.
11 C. Environmental Product Declarations: (EPD) is a transparent, objective report that communicates what a product
12 is made of and how it impacts the environment across its entire life cycle.
13 D. Health Product Declaration (HPD) is a material ingredient reporting standard developed under the guidance of the
14 HPD Collaborative.
15 E. Hydrofluorocarbons (HFCs): Refrigerants used in building equipment that do not deplete the stratospheric ozone
16 layer.
17 F. LEED: Leadership in Energy and Environmental Design. Green Building Rating System representing the US Green
18 Building Council's effort to provide a national standard for what constitutes a "green building". The standard
19 requires quantitative and technical documentation to demonstrate compliance with goals described in the US
20 Green Building Council's Green Building Rating System, Version 4.0 (and v4.1 for select credits.)
21 G. LEED Project Administrator: LEED Certified Professional hired by the project owner to review LEED submittals.
22 H. Post-Consumer Recycled Content: The percentage of waste material by weight available from consumer use
23 incorporated into a building material.
24 I. Pre-consumer (aka Post-Industrial Recycled) Content: The percentage of waste material by weight available from
25 industrial use incorporated into a building material. Post-industrial recyclable materials are different from
26 industrial scrap, a by-product of industrial processes that can easily be reused as a feedstock.
27 J. Potable Water: Water that is suitable for drinking and is supplied from wells or municipal water systems.
28 K. Recycling: The collection, reprocessing, marketing and use of materials that were recovered or diverted from the
29 solid waste stream. Note that LEED uses the term "pre-consumer" rather than "post-industrial." Also note that
30 when manufacturers and trade associations use the term "post- industrial" it often includes spills, scraps, and
31 damaged and surplus materials that are fed back into the same manufacturing process and that these materials
32 are not considered recycled content by the LEED rating systems.
33 L. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled
34 fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value. "Post-
35 consumer" material is defined as waste material generated by households or by commercial, industrial, and
36 institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
37 "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process.
38 Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being
39 reclaimed within the same process that generated it.
40 M. Solar Reflectance: See "Albedo."
41 N. Sustainable Forestry: The practice of managing forest resources to meet the long-term product needs of humans
42 while maintaining the biodiversity of forested landscapes. The primary goal is to restore, enhance, and sustain a
43 full range of forest values, both economic and ecological.
44 O. Ventilation: The process of supplying and removing air to and from interior spaces by natural or mechanical means.
45 P. Volatile organic compounds (VOCs): Chemical compounds based on carbon and hydrogen structures that are
46 vaporized at room temperatures. VOCs are one type of indoor air contaminant.
47 Q. Waste Materials: Large and small pieces of materials indicated which are excess to contract requirements and
48 generally include materials salvaged from existing construction and items of trimmings, cuttings, and damaged
49 goods resulting from new installations which cannot be effectively used in Work.
50

51 **1.4 ADMINISTRATIVE REQUIREMENTS**

- 52 A. Respond to questions and requests from Architect and the Green Building Certification Institute (GBCI; an agent
53 of USGBC that handles the review process) regarding LEED credits that are the responsibility of the Contractor,
54 that depend on product selection or product qualities, or that depend on Contractor's procedures until GBCI has
55 made its determination on the project's LEED certification application. Document responses as informational
56 submittals.
57

1 **1.5 ACTION SUBMITTALS**

- 2 A. General: Submit additional LEED submittals required by other Specification Sections.
- 3 C. LEED Submittals: Submit LEED related information under a separate Tab within each product submittal. The LEED
4 submittal shall include:
- 5 1. Summary Sheet: A summary, on General Contractors letterhead, of all LEED information requested in
6 specifications shall include:
- 7 a. BARTILLON HOMELESS SHELTER.
- 8 b. LEED Submittal List: A list of all materials being submitted. For products composed of multiple
9 materials the submittal shall include a list of all materials composing the product.
- 10 c. For Products in Divisions 2 – 10 and select products (indicated in the specification) from Divisions
11 21-28, include the following information:
- 12 i. Material costs, for each material on the LEED submittal list, excluding labor costs, delivery
13 cost, cost of installation, as well as profit and overhead.
- 14 ii. The preconsumer and post-consumer recycled content of each material on the LEED
15 submittal list.
- 16 iii. List of all material manufacturing locations.
- 17 iv. Provide distance between manufacturing and construction site.
- 18 d. All other LEED information required in specification.
- 19 2. Manufacturer’s literature with information highlighted that confirm the figures used in the summary
20 report.
- 21 a. If a range is used in the manufacturer’s literature, the summary report shall use the lowest number
22 in the range.
- 23 b. For VOC Submissions: Submit MSDS sheets or manufacturer’s literature with VOC figure highlighted.
- 24 D. Project Material Costs Data: Provide a statement, on Contractor’s letterhead, documenting the total material for
25 the project. Include a spreadsheet tallying the material cost for all materials specified in Divisions 2 - 32. The total
26 in the material cost data will be used in the LEED Online template to be completed by the Contractor as the actual
27 material cost of the project.
- 28 E. LEED Action Plan: Provide preliminary submittal within 30 days of Notice to Proceed that contains:
- 29 1. Example spreadsheets for each construction credit identified in this section.
- 30 2. Contact information for Contractor’s LEED coordinators.
- 31 3. Brief description of how the following requirements will be met.
- 32 a. SS Prerequisite: Construction Activities Pollution Prevention complying with Section 31 25 00,
33 Erosion Control.
- 34 b. MR Prerequisite: Construction and Demolition Waste Management Planning
- 35 c. MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations
- 36 d. MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials
- 37 e. MR Credit: Building Product Disclosure and Optimization – Material Ingredients
- 38 f. MR Credit: Construction and Demolition Waste Management complying with Section 01 74 19
39 Construction Waste Management and Disposal. Include a sample spreadsheet showing how the
40 tipping information is going to be recorded to comply with LEED requirements.
- 41 g. IEQ Credit: Low-Emitting Materials
- 42 h. IEQ Credit: Construction IAQ Management Plan
- 43 i. IEQ Credit: Indoor Air Quality Assessment
- 44 4. After CPM approval of the Preliminary Action Plan the Contractor shall update the plan monthly with LEED
45 information collected to date and be submitted as part of a monthly progress report.
- 46 F. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing the actual
47 construction and purchasing activities with LEED requirements for the following:
- 48 1. SS Prerequisite: Construction Activities Pollution Prevention
- 49 2. MR Prerequisite: Construction and Demolition Waste Management Planning
- 50 3. MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations
- 51 4. MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials
- 52 5. MR Credit: Building Product Disclosure and Optimization – Material Ingredients
- 53 6. MR Credit: Construction and Demolition Waste Management
- 54 7. IEQ Credit: Low-Emitting Materials
- 55 G. LEED Documentation Online Submittals: The Contractor shall be responsible for completing the following LEED
56 submissions using the LEED online tool for credit submission to USGBC. The LEED Project Administrator will
57 determine if the information prepared by the Contractor is satisfactory for USGBC submission.
- 58 1. SS Prerequisite: Construction Activities Pollution Prevention

- 1 2. MR Prerequisite: Construction and Demolition Waste Management Planning
- 2 3. MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations
- 3 4. MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials
- 4 5. MR Credit: Building Product Disclosure and Optimization – Material Ingredients
- 5 6. MR Credit: Construction and Demolition Waste Management
- 6 7. IEQ Credit: Low-Emitting Materials

8 **1.6 QUALITY ASSURANCE**

- 9 A. LEED Coordinator: The Contractor is to engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

12 **1.7 CONTRACTOR RESPONSIBILITIES**

- 13 A. This project has been registered with USGBC via LEED Online. The Contractor shall provide all necessary documentation for LEED BD&C v4.0 (and v4.1 for select credits) certification in accordance with the specifications. Format and content of all construction documentation must be in accordance with the LEED Reference Guide requirements for supporting data required in event of USGBC audit of the particular credit. Contractor is required to coordinate all requirements for credits stated in this section to assure assembled data is acceptable to USGBC and respond to USGBC requests for additional construction data in the course of preparing the project for certification.

21 **PART 2 – PRODUCTS**

23 **2.1 MATERIALS, GENERAL**

- 24 A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.
- 27 B. Refer to LEED Guidebook for further information.

29 **2.2 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION (V 4.1)**

- 30 A. MR Credit Product Disclosure and Optimization - Environmental Product Declarations (EPD)
 - 31 1. At least 20 different permanently installed products sourced from at least five different manufacturers shall meet one of the disclosure criteria below:
 - 33 a. Life-cycle assessment and environmental product declarations.
 - 34 1. Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.
 - 37 2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071. Products with product-specific internal EPDs which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.
 - 41 3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. Products with industry-wide EPDs, which conform to ISO 14025, and EN 15804 or ISO 21930 and have at least a cradle to gate scope are valued as one whole product for the purposes of credit achievement calculation.
 - 46 b. Environmental Product Declarations which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - 48 1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review are valued as 1.5 products for the purposes of credit achievement calculation.
 - 51 2. At least 5 permanently installed products sourced from at least three different manufacturers shall have a compliant embodied carbon optimization report or action plan separate from the LCA or EPD. Products are valued according to the table below:

Report Type	Reference Document(s) for the Optimization Report	Report Verification	Valuation
-------------	---	---------------------	-----------

Embodied Carbon/LCA Action Plan	Product-specific LCA or product-specific Type III EPD	Prepared by the manufacturer and signed by company executive	½ product
Reductions in Embodied Carbon: less than 10% reduction in GWP relative to baseline	Baseline: Product-specific LCA, Product-specific Type III EPD, or Industry-wide Type III EPD	Comparative analysis is verified by an independent party	1 product
Reductions in Embodied Carbon: 10%+ reduction in GWP relative to baseline	Optimized: Product-specific LCA or product-specific Type III EPD		1.5 products
Reductions in Embodied Carbon: 20%+ reduction in GWP and 5%+ reduction in two additional impact categories, relative to baseline	Baseline: Product-specific LCA or Product-specific Type III EPD Optimized: Product-specific LCA or product-specific Type III EPD		2 products

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B. MR Credit Product Disclosure and Optimization – Sourcing of Raw Materials

1. At least 20 different permanently installed products from at least five different manufacturers shall have publicly released a report from their raw material suppliers which include raw material supplier extraction locations, a commitment to long-term ecologically responsible land use, a commitment to reducing environmental harms from extraction and/or manufacturing processes, and a commitment to meeting applicable standards or programs voluntarily that address responsible sourcing criteria.
 - a. Products sourced from manufacturers with self-declared reports are valued as one half (1/2) of a product for credit achievement.
 - b. Third-party verified corporate sustainability reports (CSR) which include environmental impacts of extraction operations and activities associated with the manufacturer’s product and the product’s supply chain, are valued as one whole product for credit achievement calculation. Acceptable CSR frameworks include the following:
 1. Global Reporting Initiative (GRI) Sustainability Report
 2. Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises
 3. U.N. Global Compact: Communication of Progress
 4. ISO 26000: 2010 Guidance on Social Responsibility
 5. USGBC approved program: Other USGBC approved programs meeting the CSR criteria.
2. Products shall meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project.
 - a. Extended producer responsibility. Products purchased from a manufacturer (producer) that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility. Products meeting extended producer responsibility criteria are valued at 50% of their cost for the purposes of credit achievement calculation.
 - b. Bio-based materials. Bio-based products must meet the Sustainable Agriculture Network’s Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material. Products meeting bio-based materials criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
 - c. Wood products. Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
 - d. Materials reuse. Reuse includes salvaged, refurbished, or reused products. Products meeting materials reuse criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
 - e. Recycled content. Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost. Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.
 - f. USGBC approved program. Other USGBC approved programs meeting leadership extraction criteria.

- 1 3. For credit achievement calculation, products sourced (extracted, manufactured, and purchased) within
2 100 miles (160 km) of the project site are valued at 200% of their base contributing cost. For credit
3 achievement calculation, the base contributing cost of individual products compliant with multiple
4 responsible extraction criteria is not permitted to exceed 100% its total actual cost (before regional
5 multipliers) and double counting of single product components compliant with multiple responsible
6 extraction criteria is not permitted and in no case is a product permitted to contribute more than 200% of
7 its total actual cost. Structure and enclosure materials may not constitute more than 30% of the value of
8 compliant building products. Projects with significant amounts of structural and enclosure materials may
9 exceed the 30% limit by calculating an alternative structure and enclosure limit (See Calculations under
10 Further Explanation).
11
- 12 C. MR Credit Product Disclosure and Optimization – Material Ingredients
13 1. At least 20 different permanently installed products from at least five different manufacturers shall use any
14 of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000
15 ppm).
16 a. ANSI/BIFMA e3 Furniture Sustainability Standard. The documentation from the assessor or
17 scorecard from BIFMA must demonstrate the product earned 4, 5, 7, or 8 points under 7.5.1.1
18 Chemical Assessment in e3-2019 (Pathway 1), 3 points under 7.5.2.2 Advanced Level in e3-2019
19 (Pathway 2), or at least 3 points under 7.5.1.3 Advanced Level in e3-2014 or at least 3 points under
20 7.5.1.3 Advanced Level in e3-2014.
21 b. For e3-2019: If product achieved 3 points under 7.5.1.1 in e3-2019 using the GHS classification sub-
22 path, then the product meets this requirement. Manufacturer to provide additional backup
23 documentation to show which sub-path was used in Pathway 1 (7.5.1) in this instance.
24 c. Cradle to Cradle. Product has Material Health Certificate or is Cradle to Cradle Certified™ under
25 standard version 3 or later with a Material Health achievement level at the Bronze level or higher.
26 d. Declare. The Declare product label must meet the following requirements:
27 1. Declare labels designated as Red List Free, LBC Red List Free, or Declared.
28 2. Declare labels designated as LBC Red List Approved or LBC Compliant that demonstrate
29 content inventory to 0.1% (1000 ppm).
30 e. Facts – NSF/ANSI 336: Sustainability Assessment for Commercial Furnishings Fabric at any
31 certification level.
32 f. Global Green TAG. Product Health Declaration (PHD) labels issued after January 1, 2020.
33 g. Health Product Declaration. The end use product has a published and complete Health Product
34 Declaration with full disclosure of known hazards in compliance with the Health Product Declaration
35 Open Standard.
36 h. Living Product Challenge. The included Declare product label must demonstrate content inventory
37 to 0.1% (1000 ppm).
38 i. Manufacturer Inventory. The manufacturer has published complete content inventory for the
39 product following these guidelines:
40 1. A publicly available inventory of all ingredients identified by name and Chemical Abstract
41 Service Registration Number (CASRN) and/or European Community Number (EC Number).
42 2. Materials defined as trade secret or intellectual property may withhold the name and/or
43 CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard
44 score/class using either:
45 A. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)
46 B. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6
47 (2015) (GHS)
48 1. The hazard screen must be applied to each trade secret ingredient and the
49 inventory lists the hazard category for each of the health hazards included
50 in Part 3 of GHS (e.g. “GHS Category 2 Carcinogen”).
51 j. Product Lens Certification
52 2. Any compliant reports above with third-party verification that includes the verification of content inventory
53 are worth 1.5 products for credit achievement calculations.
54 3. At least 5 permanently installed products sourced from at least three different manufacturers shall have a
55 compliant material ingredient optimization report or action plan. Products are valued according to the
56 table below.
57

Report Type & Criteria	Product Documentation	Report Verification	Valuation
Material Ingredient Screening and Optimization Action Plan	Action Plan based on publicly available material inventory to at least 1,000ppm.	Prepared by the manufacturer and signed by company executive	½ product
Advanced Inventory & Assessment: Inventory to at least 0.01% by weight (100 ppm) and no GreenScreen LT-1 hazards or GHS Category 1 hazards are present. Or Inventory to at least 0.01% by weight (100ppm) and at least 75% by weight of product is assessed using GreenScreen. The remaining 25% by weight of product has been inventoried and the GreenScreen assessment is publicly available.	<i>Cradle to Cradle Certified or Material Health Certificate</i> at Bronze level or higher. <i>Declare</i> labels designated as Red List Free or LBC Red List Free. <i>Green Seal</i> . Products certified under the Standard for Paints, Coatings, Stains and Sealers (GS-11, Edition 4.0) that do not include GHS Reproductive toxins (categories 1 and 2). <i>Health Product Declaration</i> that meet optimization and verification criteria. <i>Living Product Challenge</i> certified products that include a Red List Free or LBC Red List Free Declare label. <i>Manufacturer Inventory</i> that meet optimization and verification criteria.	Third-party verified	1 product
Material Ingredient Optimization: Inventory to at least 0.01% by weight (100 ppm) and at least 95% by weight of product is assessed using GreenScreen. No BM-1 hazards are present. The remaining 5% not assessed has been inventoried and screened using GreenScreen List Translator and no GreenScreen LT-1 hazards are present.	<i>Cradle to Cradle Certified or Material Health Certificate</i> at Silver level or higher. <i>Health Product Declaration</i> that meet optimization and verification criteria. <i>Living Product Challenge</i> certified products that achieve Imperative 09: Transparent Material Health. <i>Manufacturer Inventory</i> that meet optimization and verification criteria.		1.5 products
International Alternative Compliance Path: <i>Available to projects located outside of the US</i>	<i>REACH Optimization</i> : Material Inventory to 100ppm with no substances found on the Authorization List – Annex XIV, the Restriction list – Annex XVII and the SVHC candidate list. OR <i>Global Green TAG</i> PHD report.	<i>REACH</i> report prepared by the manufacturer, OR PHD Report verified by <i>Global Green TAG</i>	1 product

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4. For credit achievement calculation, products sourced (extracted, manufactured, purchased) within 100 miles (160 km) of the project site are valued at twice their base contributing number of products, up to a maximum of 2 products.

2.3 LOW-EMITTING MATERIALS (V 4.1)

- A. Materials on the building interior shall meet the low-emitting criteria below.
 1. Paints and Coatings
 - a. At least 75% of all paints and coatings, by volume or surface area, meet the *VOC emissions evaluation* AND 100% meet the *VOC content evaluation*. To meet the 100% requirement for VOC content evaluation, a VOC budget may be used.
 - b. The paints and coatings product category includes all interior paints and coatings wet-applied on site, specialized finished (dyes, sealers, hardeners and toppings for concrete floors), and plasters.
 - c. Exclude foamed-in place and sprayed insulation (include in Insulation category).
 2. Adhesives and Sealants
 - a. At least 75% of all adhesives and sealants, **by volume or surface area**, meet the *VOC emissions evaluation* AND 100% meet the *VOC content evaluation*. To meet the 100% requirement for VOC content evaluation, a VOC budget may be used.
 - b. The adhesives and sealants product category includes all interior adhesives and sealants wet-applied on site.
 3. Flooring
 - a. At least 90% of all flooring, by cost or surface area, meets the *VOC emissions evaluation* OR *inherently nonemitting sources criteria*, OR *salvaged and reused materials criteria*.

- 1 b. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic,
2 vinyl, rubber, engineered, solid wood, laminates), raised flooring, wall base, transition strips/stair
3 nosing, grills, entryway systems, underlayments, and other floor coverings.
4 c. Exclude poured concrete, subflooring (include subflooring in the composite wood category, if
5 applicable), and wet-applied products applied on the floor (include in paints and coatings
6 category).
- 7 4. Wall panels
8 a. At least 75% of all wall panels, by cost or surface area, meet the *VOC emissions evaluation*,
9 OR *inherently nonemitting sources criteria*, OR *salvaged and reused materials criteria*.
10 b. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling,
11 wall tile), gypsum or curtain walls, retail slatwall, trim, interior and exterior doors, non-structural
12 wall framing, interior and exterior windows, window treatments, countertops, laminate/veneer
13 used for built-in cabinetry, non-structural sandwich panels, and CMU.
14 c. Exclude cabinetry (include the composite wood components of built-in cabinetry in the composite
15 wood category and free-standing cabinetry in the furniture category), and vertical structural
16 elements (include structural wood panels or structural composite wood in the composite wood
17 category, if applicable), bathroom accessories, and door hardware.
- 18 5. Ceilings
19 a. At least 90% of all ceilings, by cost or surface area, meet the *VOC emissions evaluation*,
20 OR *inherently nonemitting sources criteria*, OR *salvaged and reused materials criteria*.
21 b. The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such
22 as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights.
23 c. Exclude overhead structural elements (include structural elements in the composite wood
24 category, if applicable).
- 25 6. Insulation
26 a. At least 75% of all insulation, by cost or surface area, meets the *VOC emissions evaluation*.
27 b. The insulation product category includes all thermal and acoustic boards, batts, rolls, blankets,
28 sound attention fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.
29 c. Exclude insulation for HVAC ducts and plumbing piping from the credit. Insulation for HVAC ducts
30 may be included at the project team’s discretion.
- 31 7. Furniture
32 a. At least 75% of all furniture in the project scope of work, by cost, meets the *furniture emissions*
33 *evaluation*, OR *inherently nonemitting sources criteria*, OR *salvaged and reused materials criteria*.
34 b. The furniture product category includes all seating, desks and tables, filing/storage, free-standing
35 cabinetry, systems furniture, moveable/demountable partitions, bathroom/toilet partitions,
36 shelving, lockers, specialty and custom fixtures and furniture, and furnishing items (such as area
37 rugs, cubicle curtains, mattresses, and mirrors) purchased for the project.
38 c. Exclude office and bathroom accessories, art, recreational items, and planters from the credit.
- 39 8. Composite Wood
40 a. At least 75% of all composite wood, by cost or surface area, meets the *Formaldehyde emissions*
41 *evaluation* OR *salvaged and reused materials criteria*.
42 b. The composite wood product category includes all particleboard, medium density fiberboard
43 (both medium density and thin), hardwood plywood with veneer, composite or combination core,
44 and wood structural panels or structural wood products.
45 c. Exclude products covered in the flooring, ceiling, wall panels, or furniture categories
- 46 B. Low-emitting criteria
47 1. Inherently nonemitting sources
48 a. Product is an inherently nonemitting source of VOCs (stone, ceramic, powder-coated metals,
49 plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood) and
50 has no binders, surface coatings, or sealants that include organic chemicals.
51 2. Salvaged and reused materials
52 a. Product is more than one year old at the time of use. If finishes are applied to the product on-site,
53 the finishes must meet the *VOC emissions evaluation* AND *VOC content evaluation* requirements.
54 3. VOC emissions evaluation
55 a. Product has been tested according to California Department of Public Health (CDPH) Standard
56 Method v1.2–2017 and complies with the VOC limits in Table 4-1 of the method. (Table 4-1
57 provided at the end of this section.) Additionally, the range of total VOCs after 14 days (336 hours)

- 1 was measured as specified in the CDPH Standard Method v1.2 and is reported (TVOC ranges: 0.5
2 mg/m³ or less, between 0.5 and 5 mg/m³, or 5 mg/m³ or more).
- 3 b. Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods
4 they use. Products used in any setting other than schools and classrooms must be modeled to
5 private office scenario. For schools projects, modeling to office and/or schools scenario is
6 permitted.
- 7 c. The statement of product compliance must include the exposure scenario(s) used, the range of
8 total VOCs, and must follow the product declaration guidelines in CDPH Standard Method v1.2-
9 2017, Section 8. Manufacturer statements must also include a summary report from the
10 laboratory that is less than three years old and the amount of wet-applied product applied in
11 mass per surface area (if applicable). Organizations that certify manufacturers' claims must be
12 accredited under ISO/IEC 17065.
- 13 4. VOC content evaluation
- 14 a. Product meets the VOC content limits outlined in one of the applicable standards and for projects
15 in North America, methylene chloride and perchloroethylene may not be intentionally added.
- 16 b. Statement of product compliance must be made by the manufacturer or a USGBC-approved third-
17 party. Any testing must follow the test method specified in the applicable regulation. If the
18 applicable regulation requires subtraction of exempt compounds, any content of intentionally
19 added exempt compounds larger than 1% weight by mass (total exempt compounds) must be
20 disclosed.
- 21 1. Paints and coatings:
- 22 A. California Air Resource Board (CARB) 2007 Suggested Control Measure (SCM) for
23 Architectural Coatings
- 24 B. South Coast Air Quality Management District (SCAQMD) Rule 1113, amended
25 February 5, 2016, effective date 1/1/19.
- 26 2. Adhesives and sealants:
- 27 A. SCAQMD Rule 1168, amended October 6, 2017
- 28 5. Formaldehyde emissions evaluation
- 29 a. Product meets one of the following:
- 30 1. Certified as ultra-low-emitting formaldehyde (ULEF) product under EPA Toxic Substances
31 Control Act, Formaldehyde Emission Standards for Composite Wood Products (TSCA, Title
32 VI) (EPA TSCA Title VI) or California Air Resources Board (CARB) Airborne Toxic Control
33 Measure (ATCM)
- 34 2. Certified as no added formaldehyde resins (NAF) product under EPA TSCA Title VI or CARB
35 ATCM
- 36 3. Wood structural panel manufactured according to PS 1-09 or PS 2-10 (or one of the
37 standards considered by CARB to be equivalent to PS 1 or PS 2) and labeled bond
38 classification Exposure 1 or Exterior
- 39 4. Structural wood product manufactured according to ASTM D 5456 (for structural
40 composite lumber), ANSI A190.1 (for glued laminated timber), ASTM D 5055 (for I-joists),
41 ANSI PRG 320 (for cross-laminated timber), or PS 20-15 (for finger-jointed lumber).
- 42 6. Furniture emissions evaluation
- 43 a. Product has been tested in accordance with ANSI/BIFMA Standard Method M7.1–2011 (R2016)
44 and complies with ANSI/BIFMA e3-2014e or e3-2019e Furniture Sustainability Standard, Sections
45 7.6.1 (for half credit, by cost) OR 7.6.2 (for full credit, by cost), OR 7.6.2 AND 7.6.3 for one and a
46 quarter credit, by cost. Laboratories that conduct the tests must be accredited under ISO/IEC
47 17025 for the test methods they use.
- 48 b. Seating products must be evaluated using the seating scenario. Classroom furniture must be
49 evaluated using the standard school classroom scenario. Other products should be evaluated
50 using the open plan or private office scenario, as appropriate. The open plan scenario is more
51 stringent.
- 52 c. Statements of product compliance must include the exposure scenario(s). Organizations that
53 certify manufacturers' claims must be accredited under ISO/IEC 17065.
- 54
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56 **PART 3 – EXECUTION**

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1 **3.1 NONSMOKING BUILDING**

- 2 A. Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-
3 air intakes.
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5 **3.2 CONSTRUCTION ACTIVITIES POLLUTION PREVENTION**

- 6 A. SS Prerequisite - Construction Activities Pollution Prevention:
7 1. Follow LEED instructions in LEED NCv4.0 Reference Guide and comply with Section 31 25 00, Erosion
8 Control. Comply with EPA Construction General Permit (CGP) standard 2012.
9 2. Contractor is responsible for completing the LEED online credit template and attaching the following
10 information to the template:
11 a. Track implementation of the Erosion and Sediment Control (ESC) plan by keeping written records
12 or date-stamped photographs. Write a narrative description of ESC plan implementation with the
13 following information:
14 i. Timing of the implementation of the plan
15 ii. Specific control measures applied on site
16 iii. Maintenance protocols used to ensure the proper function of control measures
17 3. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory
18 for GBCI submission.
19

20 **3.3 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION**

- 21 A. MR Credits Building Product Disclosure Optimization – EPDs, Sourcing and Ingredients (**v.4.1**)
22 1. Environmental Product Declarations – comply with both of the following Options:
23 a. Option 1: Environmental Product Declarations (1 point)
24 b. Option 2: Multi-Attribute Optimization (1 point) including products that demonstrate impact
25 reduction below industry average in global warming potential, ozone depletion, acidification of land
26 and water, eutrophication, tropospheric ozone, or other USGBC approved program.
27 2. Sourcing of Raw Materials – comply with both of the following Options:
28 a. Option 1: Raw Material Source and Extraction Reporting (1 point)
29 b. Option 2: Leadership Extraction Practices (1 point) including producer responsibility, bio-based
30 materials, wood products, material reuse, recycle content or other approved USGBC program
31 3. Material Ingredients - comply with both of the following Options:
32 a. Option 1: Material Ingredient Reporting (1 point)
33 b. Option 2: Material Ingredient Optimization (1 point) including GreenScreen v1.2 Benchmark, Cradle
34 to Cradle Certification, REACH Optimization or other approved USGBC program.
35 4. Contractor to complete and submit the MR building product disclosure and optimization calculator,
36 available with the project in LEED Online
37 5. Contractor to submit supporting documentation including EPD and LCA reports, corporate sustainability
38 reports, product declarations, labels, REACH, GreenScreen Benchmark, LT scores or other compliance
39 summary documents. LEED project administrator and/or GBCI may require revisions and additions to this
40 documentation and Contractor should plan accordingly.
41 6. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory
42 for GBCI submission.
43

44 **3.4 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING**

- 45 A. MR Prerequisite and Credit: Comply with Division 01 74 19 “Construction Waste Management and Disposal”.
46 1. Contractor is required to create a Construction Waste Management Plan that includes:
47 a. Establishing waste diversion goals for the project by identifying at least five material streams
48 targeted for diversion. Approximate a percentage of the overall project waste that these materials
49 represent.
50 b. Specifying whether materials will be separated or commingled and describe the diversion strategies
51 planned for the project. Describe where the material will be taken and how the recycling facility
52 will process the material.
53 c. A final report detailing all major waste streams generated, including disposal and diversion rates.
54 2. Contractor is required to meet the following minimum goal:
55 a. Option 1 Path 2 – Divert 75% and four material streams
56 i. A material stream can be a specific material category that is diverted in a specific way or a
57 mixture of several material categories that are diverted in a specific way.

- 1 1. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
- 2 2. Prohibit the use of tobacco products inside the building and within 25 feet of the building entrances during
- 3 construction.
- 4 3. Protect absorptive materials stored on-site and installed from moisture damage.
- 5 4. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period
- 6 as specified in Division 1 Section "Temporary Facilities and Controls", install filter media having a MERV 8
- 7 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
- 8 5. Replace all air filters immediately prior to occupancy.
- 9 B. Provide record of compliance with Indoor Air Quality Management Plan:
- 10 a. Monthly photographs of equipment and ductwork protection.
- 11 b. Monthly photographs of filters used to protect air distribution and equipment.
- 12 c. Contractor's report documenting that MERV 8 filters were used to protect equipment during
- 13 construction and filters meeting final design requirements were installed prior to occupancy.
- 14

15 3.8 INDOOR AIR QUALITY ASSESSMENT


- 16 A. IEQ Credit – Indoor Air Quality Assessment: Intent is to establish better quality indoor air in the building after
- 17 construction and during occupancy.
- 18 B. Contractor is required to implement one of the following options:
- 19 1. Option 1, Path 1 (1 point): After construction ends, prior to occupancy and with all interior finishes and
- 20 furniture installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor
- 21 air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and no higher
- 22 than 80 deg F and a relative humidity no higher than 60 percent.
- 23 a. Preliminary calculations made by the mechanical engineer during design indicate this path will
- 24 take between 30 and 90 days depending on how many hours per day the outside air is available at
- 25 the required temperature and humidity.
- 26 2. Option 1, Path 2 (1 point): If occupancy is desired prior to flush-out completion, with furniture installed,
- 27 the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor
- 28 area to the space while maintaining an internal temperature of at least 60°F and no higher than 80°F and
- 29 relative humidity no higher than 60%. Once a space is occupied, it shall be ventilated at a minimum rate of
- 30 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in IEQ Prerequisite 1,
- 31 whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three
- 32 (3) hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a
- 33 total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.
- 34 a. Preliminary calculations made by the mechanical engineer during design indicate this will take
- 35 between 8 and 22 days before occupancy and an additional 19 to 40 days during occupancy. The
- 36 variance is a result of uncertainty about how many hours per day outdoor air will meet the
- 37 required temperature and humidity conditions.
- 38 3. Option 2 (2 points) - Air-Quality Testing: If the Contractor chooses to test for compliance with this credit
- 39 following is required, including contracting with an industrial hygienist to conduct testing:
- 40 a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using
- 41 testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air
- 42 Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and
- 43 Construction Reference Guide".
- 44 b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:
- 45 i. Formaldehyde: 27 ppb.
- 46 ii. Particulates (PM10): 50 micrograms/cu. m.
- 47 iii. Particulates (PM2.5): 15 micrograms/cu. m.
- 48 iv. Ozone: 0.075 ppm
- 49 v. Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
- 50 vi. Target chemicals listed in CDPH Standard Method v1.1, Table 4-1, except formaldehyde -see
- 51 *supplement at end of this specification for table*
- 52 vii. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.
- 53 c. For each sampling point where the maximum concentration limits are exceeded, conduct additional
- 54 flush-out with outside air and retest the specific parameter(s) exceeded to indicate the
- 55 requirements are achieved. Repeat procedure until all requirements have been met. When
- 56 retesting non-complying building areas, samples are to be taken from the same locations as the
- 57 first test.
- 58 d. Air-sample testing shall be conducted as follows:

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- i. All measurements shall be conducted prior to occupancy but during normal occupied hours and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
 - ii. Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, acoustic tiles and non-fixed furnishings such as workstations and partitions.
 - iii. Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
 - iv. Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four- hour period.
4. The LEED Project Administrator will determine if the information prepared by the Contractor is satisfactory for GBCI submission.

17 **3.9 SUPPLEMENT**

- 18 A. The supplement listed below, up to "End of Section," is a part of this Specification:
- 19 1. LEED BD&C v4.0 Project Checklist.
- 20 a. All credits listed for reference
- 21 b. Only **Bold, Italic** credits or prerequisites listed with a "C" are in the Scope of the Contractor
- 22 c. All identified construction Prerequisites are required to be achieved to complete the certification
- 23 process and are the responsibility of the Contractor. Care needs to be taken to ensure all
- 24 prerequisites are awarded to the project.
- 25 d. All identified construction Credits are required to be achieved and are the responsibility of the
- 26 Contractor. Given certain point totals and project specific circumstances as the project progresses,
- 27 with proper notice to the CPM, certain credits or credit point thresholds can be eliminated from the
- 28 project. Written notice and approval is required.
- 29 e. Select credits are identified as following LEED BD&C version 4.1 rather than v 4.0.
- 30 2. Target CREL VOCs, Table 4-1 for Indoor Air Quality Testing
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					BARTILLON HOMELESS SHELTER LEED v4.0 for BD+C: New Construction and Major Renovations Project Checklist 2-16-2024		
1	0	0	0		Integrative Process		Possible Points: 1
Y	?Y	?N	N	D/C			
1				D	Credit	Integrative Process	1
8	0	0	8		Location and Transportation		Possible Points: 16
Y	?Y	?N	N	D/C			
			0	D	Credit	LEED for Neighborhood Development Location	16 or
1				D	Credit	Sensitive Land Protection	1
1			1	D	Credit	High Priority Site	1-2
2			3	D	Credit	Surrounding Density and Diverse Uses	1-5
1			4	D	Credit	Access to Quality Transit	1-5
1				D	Credit	Bicycle Facilities (use v4.1)	1
1				D	Credit	Reduced Parking Footprint	1
1				D	Credit	Green Vehicles (use v4.1)	1
9	0	0	1		Sustainable Sites		Possible Points: 10
Y	?Y	?N	N	D/C			
Y	-	-	-	C	Prereq	Construction Activity Pollution Prevention	-
1				D	Credit	Site Assessment	1
1			1	D	Credit	Site Development - Protect or Restore Habitat (use v4.1)	1-2
1				D	Credit	Open Space	1
3				D	Credit	Rainwater Management	2-3
2				D	Credit	Heat Island Reduction	1-2
1				D	Credit	Light Pollution Reduction	1
7	0	0	4		Water Efficiency		Possible Points: 11
Y	?Y	?N	N	D/C			
Y	-	-	-	D	Prereq	Water Use Reduction—20% Reduction	-
Y	-	-	-	D	Prereq	Water Efficient Landscaping	-
Y	-	-	-	D	Prereq	Innovative Wastewater Technologies	-
2				D	Credit	Outdoor Water Use Reduction	1-2
4			2	D	Credit	Indoor Water Use Reduction	1-6
			2	D	Credit	Cooling Tower Water Use	1-2
1				D	Credit	Water Metering	1

28	0	0	5		Energy and Atmosphere		Possible Points:	33
Y	?Y	?N	N	D/C				
Y	-	-	-	C	Prereq	Fundamental Commissioning and Verification		-
Y	-	-	-	D	Prereq	Minimum Energy Performance		-
Y	-	-	-	D	Prereq	Building Level Energy Metering		-
Y	-	-	-	D	Prereq	Fundamental Refrigerant Management		-
6				C	Credit	Enhanced Commissioning		2-6
16			2	D	Credit	Optimize Energy Performance		1-18
			1	D	Credit	Advanced Energy Metering		1
			2	D	Credit	Demand Response		2
3				D	Credit	Renewable Energy Production		1-3
1				D	Credit	Enhanced Refrigerant Management		1
2				D	Credit	Green Power and Carbon Offsets		1-2
7 0 0 6 Materials and Resources Possible Points: 13								
Y	?Y	?N	N	D/C				
Y	-	-	-	D	Prereq	Storage and Collection of Recyclables		-
Y	-	-	-	C	Prereq	Construction and Demolition Waste Management Reporting		-
1			4	D	Credit	Building Life-Cycle Impact Reduction (use v4.1)		2-5
2				C	Credit	Building Product Disclosure - EPD (use v4.1)		1-2 pts
1			1	C	Credit	Building Product Disclosure – Source Materials (use v4.1)		1-2 pts
1			1	C	Credit	Building Product Disclosure – Material Ingredients (use v4.1)		1-2 pts
2				C	Credit	Construction and Demo Waste Management (use v4.1)		1-2 pts
7 0 0 9 Indoor Environmental Quality Possible Points: 16								
Y	?Y	?N	N	D/C				
Y	-	-	-	D	Prereq	Minimum Indoor Air Quality Performance		-
Y	-	-	-	D	Prereq	Environmental Tobacco Smoke (ETS) Control		-
2				D	Credit	Enhanced Indoor Air Quality Strategies		1-2
3				C	Credit	Low-Emitting Materials (use v4.1)		1-3 pts
1				C	Credit	Construction IAQ Management Plan		1
1			1	C	Credit	Indoor Air Quality Assessment		1-2 pts
			1	D	Credit	Thermal Comfort		1
			2	D	Credit	Interior Lighting		1-2
			3	D	Credit	Daylight (use v4.1)		1-3
			1	D	Credit	Quality Views		1
			1	D	Credit	Acoustic Performance		1

6	0	0	0		Innovation and Design Process		Possible Points:	6
Y	?Y	?N	N	D/C				
1				D	Credit 1.1	Pilot Credit: Design for Indoor Air Quality and Infection Control	1	
1				D	Credit 1.2	Innovation Catalog: Bird Friendly Glass	1	
1				D	Credit 1.3	Innovation Catalog: Purchasing – lamps	1	
1				D	Credit 1.4	Innovation in Design (Unique Feature): Lighting/Sound for Trauma Informed Design	1	
1				D	Credit 1.5	Exemplary Performance (either Optimize Energy or Indoor Water Use Reduction)	1	
1				D	Credit 2	LEED Accredited Professional	1	
Regional Priority Credits								
4	0	0	0		Regional Priority Credits		Possible Points:	4
Y	?Y	?N	N	D/C				
1				D	Credit 1.1	Regional Priority: Sensitive Land Protection	1	
1				D	Credit 1.2	Regional Priority: Bicycle Facilities	1	
1				D	Credit 1.3	Regional Priority: Optimize Energy Performance	1	
1				D	Credit 1.4	Regional Priority: Green Vehicles	1	
Total								
77	0	0	33		Total		Possible Points:	110
Y	?Y	?N	N					

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Table 4-1 Target CREL VOCs and their maximum allowable concentrations

No.	Compound Name	CAS No.	Allowable Conc. ^a (µg/m ³)
1	Acetaldehyde	75-07-0	70
2	Benzene	71-43-2	30
3	Carbon disulfide	75-15-0	400
4	Carbon tetrachloride	56-23-5	20
5	Chlorobenzene	108-90-7	500
6	Chloroform	67-66-3	150
7	Dichlorobenzene (1,4-)	106-46-7	400
8	Dichloroethylene (1,1)	75-35-4	35
9	Dimethylformamide (N,N-)	68-12-2	40
10	Dioxane (1,4-)	123-91-1	1,500
11	Epichlorohydrin	106-89-8	1.5
12	Ethylbenzene	100-41-4	1,000
13	Ethylene glycol	107-21-1	200
14	Ethylene glycol monoethyl ether	110-80-5	35
15	Ethylene glycol monoethyl ether acetate	111-15-9	150
16	Ethylene glycol monomethyl ether	109-86-4	30
17	Ethylene glycol monomethyl ether acetate	110-49-6	45
18	n/a	n/a	n/a
19	Hexane (n-)	110-54-3	3,500
20	Isophorone	78-59-1	1,000
21	Isopropanol	67-63-0	3,500
22	Methyl chloroform	71-55-6	500
23	Methylene chloride	75-09-2	200
24	Methyl <i>t</i> -butyl ether	1634-04-4	4,000
25	Naphthalene	91-20-3	4.5
26	Phenol	108-95-2	100
27	Propylene glycol monomethyl ether	107-98-2	3,500
28	Styrene	100-42-5	450
29	Tetrachloroethylene	127-18-4	17.5
30	Toluene	108-88-3	150
31	Trichloroethylene	79-01-6	300
32	Vinyl acetate	108-05-4	100
33-35	Xylenes, technical mixture (m-, o-, p-xylene combined)	108-38-3, 95-47-6, 106-42-3	350

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a) Refer to http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html. All maximum allowable concentrations are one-half the corresponding CREL adopted by Cal/EPA OEHHA with the exception of formaldehyde. For any future changes in the CREL list by OEHHA, values in Table 4.1 shall continue to apply until these changes are published in the Standard Method.

END OF SECTION

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**SECTION 01 91 00
COMMISSIONING**

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PART 1 – GENERAL

1.1. SUMMARY

- A. Purpose: Define the responsibilities of the parties involved and the procedures related to the commissioning process.

1.2. RELATED SPECIFICATIONS

- A. Section 01 31 13 Project Management and Coordination
- B. Section 01 31 19 Project Meetings
- C. Section 01 31 23 Project Management
- D. Section 01 32 26 Construction Progress Reporting
- E. Section 01 33 23 Submittals
- F. Section 01 45 16 Field Quality Control
- G. Section 01 77 00 Closeout Procedures
- H. Section 01 78 23 Operation and Maintenance Data
- I. Section 01 78 39 As-Built Drawings
- J. Section 01 79 00 Demonstration and Training
- K. Section 01 81 13 Sustainable Design Requirements
- L. Section 01 91 19 Building Enclosure Commissioning Requirements
- M. Section 01 91 01 Monitoring Based Commissioning
- N. Section 23 05 93 Testing, Adjusting, and Balancing for HVAC
- O. Section 23 09 00 Instrumentation and Control for HVAC
- P. Section 23 09 23 Direct Digital Control (DDC) System for HVAC
- Q. Section 23 09 93 Sequence of Operations for HVAC DDC

1.3. REFERENCES

- A. ASHRAE Guideline 1.1-2007, "HVAC&R Technical Requirements for The Commissioning Process".
- B. ASHRAE Guideline 0-2005, "The Commissioning Process".

1 C. NEBB – Procedural Standards for Building Systems Commissioning.
2

3 **1.4 DEFINITIONS**

- 4 A. Acceptance Phase: Phase of construction after startup and initial checkout when functional performance tests,
5 O&M documentation review and training occurs.
- 6 B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the
7 tested modes according to the Contract Documents.
- 8 C. Architect/Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team,
9 generally the HVAC mechanical designer/engineer and the electrical designer/engineer.
- 10 D. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to
11 meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document
12 includes both narrative descriptions and lists of individual items that support the design process.
- 13 E. CxA: Commissioning Authority. An independent entity, not otherwise associated with the A/E team members or
14 the Contractor, hired by the Owner. The CxA directs and coordinates the day-to-day commissioning activities.
15 The CxA does not take an oversight role like the CM. The CxA is part of the Construction Manager (CM) team or
16 shall report directly to the CM.
- 17 F. Cx Plan: Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and
18 documentation requirements of the commissioning process.
- 19 G. Data Logging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers
20 separate from the control system.
- 21 H. Deferred Functional Tests: FPTs that are performed later, after substantial completion, due to partial occupancy,
22 equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.
- 23 I. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not
24 in compliance with the Contract Documents (that is, does not perform properly or is not complying with the
25 design intent)
- 26 J. Design Intent: A dynamic document that provides the explanation of the ideas, concepts and criteria that are
27 considered to be very important to the owner. It is initially the outcome of the programming and conceptual
28 design phases.
- 29 K. Design Narrative or Design Documentation: Sections of either the Design Intent or Basis of Design.
- 30 L. Factory Testing: Testing of equipment on-site or at the factory by factory personnel with an Owner’s
31 representative present.
- 32 M. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using
33 manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather
34 than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions
35 to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under
36 various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying
37 outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system’s
38 sequences of operation and components are verified to be responding as the sequences state. Traditional air or
39 water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB’s primary
40 work is setting up the system flows and pressures as specified, while functional testing is verifying that which has
41 already been set up. The Commissioning Authority develops the functional test procedures in a sequential
42 written form, coordinates, oversees and documents the actual testing, which is usually performed by the
43 installing contractor or vendor. FPTs are performed after prefunctional checklists and startup are complete.
- 44 N. General Contractor (GC): The prime contractor for this project. Generally refers to all the GC’s subcontractors as
45 well. Also referred to as the Contractor, in some contexts.
- 46 O. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen
47 reporting a damper to be 100% closed
- 48 P. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify
49 performance (contrasted to analyzing monitored data taken over time to make the “observation”).
- 50 Q. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using
51 dataloggers or the trending capabilities of control systems.
- 52 R. Non-Compliance: See Deficiency.
- 53 S. Non-Conformance: See Deficiency.
- 54 T. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g.,
55 changing the outside air temperature value from 50F to 75F to verify economizer operation). See also
56 “Simulated Signal.”

- 1 U. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the
- 2 expectations of how it will be used and operated. These include Project goals, measurable performance criteria,
- 3 cost considerations, benchmarks, success criteria, and supporting information.
- 4 V. Pre-Functional Checklist (PFC): A list of items to inspect and elementary component tests to conduct to verify
- 5 proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static
- 6 inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels
- 7 OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail
- 8 simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage
- 9 imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional
- 10 testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist. Even
- 11 without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist
- 12 items a Commissioning Authority will recommend. However, few contractors document in writing the execution
- 13 of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own.
- 14 The Commissioning Authority only requires that the procedures be documented in writing, and does not witness
- 15 much of the prefunctional checklisting, except for larger or more critical pieces of equipment.
- 16 W. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of
- 17 equipment.
- 18 X. Seasonal Performance Tests: FPTs that are deferred until the system(s) will experience conditions closer to their
- 19 design conditions.
- 20 Y. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying
- 21 a hair blower to a space sensor to see the response in a VAV box).
- 22 Z. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or
- 23 pressure to the transducer and DDC system to simulate a sensor value.
- 24 AA. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they
- 25 shall mean "as-built" systems, subsystems, equipment, and components.
- 26 BB. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.
- 27 CC. Subs: The subcontractors to the GC who provide and install building components and systems.
- 28 DD. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test
- 29 procedures are developed by the CxA.
- 30 EE. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test
- 31 requirements are not the detailed test procedures. The test requirements are specified in the Contract
- 32 Documents
- 33 FF. Trending: Monitoring using the building control system.
- 34 GG. Vendor: Supplier of equipment.
- 35 HH. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at
- 36 Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract
- 37 Documents and accepted submittals.

38
39 **1.5 DESCRIPTION**

- 40 A. General: Commissioning (Cx) is a systematic process of verifying that all building systems perform interactively to
- 41 meet the Owner's Project Requirements (OPR). This is achieved by beginning in the planning phase with
- 42 documenting the OPR and continuing through design, construction, acceptance, and the warranty period with
- 43 verification of performance. The Cx process shall encompass and coordinate the traditionally separate functions
- 44 of system documentation, equipment startup, control system calibration, testing and balancing, performance
- 45 testing and training. Cx during the construction phase is intended to achieve the following specific objectives
- 46 according to the Contract Documents:
- 47 1. Verify that applicable equipment and systems are installed according to the manufacturer's
- 48 recommendations and to industry accepted minimum standards and that they receive adequate
- 49 operational checkout by installing contractors.
- 50 2. Verify and document proper performance of equipment and systems.
- 51 3. Verify that O&M documentation is complete.
- 52 4. Verify that the Owner's operating personnel are adequately trained.
- 53 5. The Cx process does not take away from or reduce the responsibility of the system designers or
- 54 installing contractors to provide a finished and fully functioning product.
- 55 B. The Commissioning Authority (CxA) has no authority to change, modify or direct any work. The CxA can only
- 56 provide comments and suggestions.

- 1 C. Commissioning Plan: The Cx Plan provides guidance in the execution of the Cx process. The CxA will update the
2 Cx Plan regularly as the project progresses. The Drawings and Specifications will take precedence over the Cx
3 Plan.
- 4 D. Commissioning Team: The members of the commissioning team consist of the Commissioning Authority (CxA),
5 the Owner's Representative (OR), the designated representative of the owner's Construction Management firm
6 (CM), the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical
7 engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls
8 Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or
9 plant operator/engineer is also a member of the commissioning team.
- 10 E. Management: The CxA is hired by the Owner directly. The CxA directs and coordinates the commissioning
11 activities and the reports to the OR. All members work together to fulfill their contracted responsibilities and
12 meet the objectives of the Contract Documents.
- 13 F. Scheduling: The CxA will work with the CM and GC according to established protocols to schedule the
14 commissioning activities. The CxA will provide sufficient notice to the CM and GC for scheduling commissioning
15 activities. The GC will integrate all commissioning activities into the master schedule. All parties will address
16 scheduling problems and make necessary notifications in a timely manner in order to expedite the
17 commissioning process.
- 18 G. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting.
19 The Commissioning Plan provides a format for this schedule. As construction progresses, more detailed
20 schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

21 22 **1.6 RESPONSIBILITIES**

- 23 A. Owner
 - 24 1. Provide the OPR documentation to the CxA and Contractor for information and use.
 - 25 2. Assign operation and maintenance personnel and schedule them to participate in commissioning
26 team activities.
 - 27 3. Provide the BOD documentation, prepared by Architect and approved by Owner, to the CxA and
28 Contractor for use in developing the commissioning plan, systems manual, and operation and
29 maintenance training plan.
 - 30 4. Follow the Commissioning Plan.
 - 31 5. Attend commissioning scoping meetings and additional meetings as necessary.
- 32 B. Architect/Engineer (AE)
 - 33 1. The AE shall participate in and perform commissioning process activities including, but not limited
34 to, the following:
 - 35 a. Attend the commissioning scoping meeting and selected commissioning team meetings.
 - 36 b. Perform normal submittal review, construction observation, as-built drawing preparation,
37 O&M manual preparation, etc., as contracted.
 - 38 c. Provide any design narrative and sequence documentation requested by the CxA. The
39 designers shall assist (along with the contractors) in clarifying the operation and control of
40 commissioned equipment in areas where the specifications, control drawings or
41 equipment documentation is not sufficient for writing detailed testing procedures.
 - 42 d. Coordinate resolution of system deficiencies identified during commissioning, according to
43 the contract documents.
 - 44 e. Prepare and submit final as-built design intent documentation for inclusion in the O&M
45 manuals. Review and approve the O&M manuals.
 - 46 f. Coordinate resolution of design non-conformance and design deficiencies identified during
47 warranty-period commissioning.
 - 48 g. Participate in the resolution of non-compliance, non-conformance and design deficiencies
49 identified during commissioning during warranty-period commissioning.
- 50 C. General Contractor (GC)
 - 51 1. Construction and Acceptance Phase
 - 52 a. Assist the Construction Manager CM in the coordination of the Cx work by the CxA, and
53 with the CM and CxA ensure that Cx activities are being scheduled into the master
54 schedule.
 - 55 b. Provide an updated construction schedule to the CxA any time the schedule changes.
 - 56 c. Include the Cx activities in the contract and account for the cost of commissioning in the
57 total contract price.
 - 58 d. Attend commissioning team meetings held as needed

- e. Furnish a copy of all submittals and shop drawings pertaining to the commissioned systems for review concurrently with the Architect and Engineers.
 - f. Furnish a copy of all construction meeting agendas and minutes to the CxA.
 - g. In each purchase order or subcontract written, include requirements for submittal data, O&M data, Cx tasks and training.
 - h. GC will ensure that all Subs execute their Cx responsibilities according to the Contract Documents and schedule.
 - i. A representative from the GC and each sub associated with the Cx process shall attend the Cx pre- construction meeting and the regular Cx meetings scheduled by the CxA to facilitate the Cx process.
 - j. Coordinate and execute the training of Owner personnel.
 - k. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
 - l. Prepare and submit draft forms, including but not limited to start-up procedures, Testing and Balancing (TAB) forms, calibration forms, etc. for review by the CxA before execution.
 - m. Submit test reports to the CxA of all tests performed on components and equipment to be commissioned that are not included as part of the Construction Checklist and SPT procedures.
 - n. Complete all construction checklist and functional performance test forms as required by the Cx process.
 - o. Review and accept construction checklists provided by the CxA
 - p. Support the CxA with verification of the completion of construction checklist and functional performance tests as outlined in PART 3.
 - q. Complete paper or electronic construction checklists as work is completed and provide to the CxA
 - r. Complete and inspect all installations. Certify that all components and systems are operating as intended per Contract Documents.
 - s. Complete commissioning process test procedures
 - t. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action
 - u. Remedy all deficiencies immediately as they are identified throughout construction.
 - v. Demonstrate functionality of all systems and equipment.
 - w. Cooperate with the CxA for resolution of issues recorded in the Issues Log
 - x. Maintain an updated set of record drawings (daily) on the construction site.
 - y. Provide support and instrumentation to verify TAB reports, start-up reports, calibration reports, and any other report pertinent to the commissioned equipment and systems.
 - z. Notify the CxA no less than 21 days before all testing, start-up, and training.
 - aa. Update the CxA on a weekly basis on the progress of the Cx activities.
 - bb. Coordinate the training of Owner personnel and provide the training plan, times, and dates to the CxA
 - cc. Submit trend data in electronic format or allow access to trending data by internet connection as requested by the CxA.
 - dd. Install access points by every sensor such that the sensor can be calibrated without removal (P/T plugs, plugged holes in ducts etc.).
2. Warranty Period
- a. Execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications.
 - b. Correct deficiencies and make necessary adjustments to O&M manuals and record drawings for applicable issues identified in any seasonal testing.
- D. Subcontractors
- 1. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - a. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
 - b. Assist in equipment testing per agreements with Prime.
 - c. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the

- 1 base bid price to the Contractor, except for stand-alone data logging equipment that may
- 2 be used by the CxA.
- 3 d. Provide information requested by CxA regarding equipment sequence of operation and
- 4 testing procedures.
- 5 e. Review test procedures for equipment installed by factory representatives.
- 6 f. Complete paper or electronic construction checklists as work is completed and provide to
- 7 the CxA.
- 8 g. Follow the Commissioning Plan
- 9 h. Attend commissioning scoping meetings and additional meetings as necessary
- 10 E. Equipment Suppliers
- 11 2. The equipment suppliers shall assign representatives with expertise and authority to act on its
- 12 behalf and shall schedule them to participate in and perform commissioning process activities
- 13 including, but not limited to, the following:
- 14 a. Provide all requested submittal data, including detailed start-up procedures and specific
- 15 responsibilities of the Owner to keep warranties in force.
- 16 b. Assist in equipment testing per agreements with Subs.
- 17 c. Include all special tools and instruments (only available from vendor, specific to a piece of
- 18 equipment) required for testing equipment according to these Contract Documents in the
- 19 base bid price to the Contractor, except for stand-alone datalogging equipment that may
- 20 be used by the CxA.
- 21 d. Through the contractors they supply products to, analyze specified products and verify
- 22 that the designer has specified the newest most updated equipment reasonable for this
- 23 project's scope and budget.
- 24 e. Provide information requested by CxA regarding equipment sequence of operation and
- 25 testing procedures, including a list of final settings, setpoints, ranges, schedules, and / or
- 26 trend logs required by the CxA
- 27 f. Provide the CxA with Building Automation System trend data files as described in Section
- 28 01 91 00, Part 3, Subsection 3.7.E, Building Automation System Trending.
- 29 g. Review test procedures for equipment installed by factory representatives.
- 30 h. Follow the Commissioning Plan.
- 31 i. Attend commissioning scoping meetings and additional meetings as necessary.
- 32 F. Commissioning Authority (CxA)
- 33 3. The CxA is not responsible for design concept, design criteria, compliance with codes, design or
- 34 general construction scheduling, cost estimating, or construction management. The CxA may
- 35 assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility
- 36 resides with the general contractor and the A/E. The primary role of the CxA is to develop and
- 37 coordinate the execution of a testing plan, observe and document performance—that systems are
- 38 functioning in accordance with the documented design intent and in accordance with the
- 39 Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out
- 40 and functionally test equipment and systems:
- 41 a. Coordinate and direct the commissioning activities using consistent protocols and forms,
- 42 centralized documentation, clear and regular communications and consultations with all
- 43 necessary parties, frequently updated timelines and schedules and technical expertise.
- 44 b. Coordinate the commissioning work and, with the GC and CM, ensure that commissioning
- 45 activities are being scheduled into the master schedule.
- 46 c. Revise, as necessary, the Commissioning Plan.
- 47 d. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
- 48 e. Request and review additional information required to perform commissioning tasks,
- 49 including O&M materials, contractor start-up and checkout procedures.
- 50 f. Gather and review the current control sequences and interlocks and work with contractors
- 51 and design engineers until sufficient clarity has been obtained, in writing, to be able to
- 52 write detailed testing procedures.
- 53 g. Review and comment on normal Contractor submittals applicable to systems being
- 54 commissioned for compliance with commissioning needs, concurrent with the A/E
- 55 reviews.
- 56 h. Write and distribute prefunctional tests and checklists.
- 57 i. Develop an enhanced start-up and initial systems checkout plan with Subs.

- 1 j. Perform site visits, as necessary, to observe component and system installations. Attends
2 selected planning and job-site meetings to obtain information on construction progress.
3 Review construction meeting minutes for revisions/substitutions relating to the
4 commissioning process. Assist in resolving any discrepancies.
- 5 k. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be
6 confident that proper procedures were followed. Document this testing and include the
7 documentation in O&M manuals. Notify owner's representative of any deficiencies in
8 results or procedures.
- 9 l. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be
10 confident that proper procedures were followed. Document this testing and include the
11 documentation in O&M manuals. Notify owner's representative of any deficiencies in
12 results or procedures.
- 13 m. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist
14 reports and by selected site observation and spot checking.
- 15 n. Approve systems startup by reviewing start-up reports and by selected site observation.
- 16 o. Review TAB execution plan.
- 17 p. Approve air and water systems balancing by spot testing, by reviewing completed reports
18 and by selected site observation.
- 19 q. With necessary assistance and review from installing contractors, write the functional
20 performance test procedures for equipment and systems. This may include energy
21 management control system trending, stand-alone datalogger monitoring or manual
22 functional testing. Submit to CM for review, and for approval if required.
- 23 r. Analyze any functional performance trend logs and monitoring data to verify performance.
- 24 s. Coordinate, witness and approve manual functional performance tests performed by
25 installing contractors. Coordinate retesting as necessary until satisfactory performance is
26 achieved. Cost of retesting to be assigned to the system's responsible contractor.
- 27 t. Maintain a master deficiency and resolution log and a separate testing record. Provide the
28 CM with written progress reports and test results with recommended actions.
- 29 u. Review equipment warranties to ensure that the Owner's responsibilities are clearly
30 defined.
- 31 v. Oversee and approve the training of the Owner's operating personnel.
- 32 w. Compile and maintain a commissioning record.
- 33 x. Review and approve the preparation of the O&M manuals.
- 34 y. Provide a final commissioning report.
- 35 z. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
- 36 aa. Return to the site within 10 months into the 12 month warranty period and review with
37 facility staff the current building operation and the condition of outstanding issues related
38 to the original and seasonal commissioning. Also interview facility staff and identify
39 problems or concerns they have operating the building as originally intended. Make
40 suggestions for improvements and for recording these changes in the O&M manuals.
41 Identify areas that may come under warranty or under the original construction contract.
42 Assist facility staff in developing reports, documents and requests for services to remedy
43 outstanding problems.
44

45 **1.7 SYSTEMS TO BE COMMISSIONED**

- 46 A. The entire Heating, Ventilation and Air Conditioning (HVAC) system (boilers, chillers, pumps, piping and air
47 distribution systems)
- 48 B. Building Automation System (BAS) for the HVAC system
- 49 C. Domestic Hot Water
- 50 D. Building envelope and roofing system
- 51 E. Lighting and lighting controls
- 52 F. Renewable energy systems including solar electric (PV) system

53
54 **PART 2 – PRODUCTS**

55
56 **2.1 TEST INFORMATION**

- 57 A. All instruments needed to verify sensor readings, component performance, and system performance will be
58 provided by GC and Subs and be available to the CxA. These instruments will not be beyond what the contractors

- 1 need to complete the work specified in these construction documents. Any data logging equipment required in
2 addition to the BAS will be provided by the CxA.
- 3 B. All instruments shall be of sufficient quality and accuracy to test and/or measure system performance with the
4 tolerances specified in the Contract Documents. Refer to specification section 23 05 93- Testing, Adjusting, and
5 Balancing for required instrument tolerances.
- 6 C. All standard testing equipment required to perform startup and initial checkout and required functional
7 performance testing shall be provided by the Division contractor for the equipment being tested. For example,
8 the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for
9 the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their
10 commissioning responsibilities. Two-way radios shall be provided by the Division Contractor.
- 11 D. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required
12 for testing equipment, according to these Contract Documents shall be included in the base bid price to the
13 Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.
- 14 E. Standalone datalogging equipment and software used by the CxA to test equipment shall not become the
15 property of the Owner.
- 16 F. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with
17 the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements
18 apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an
19 accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the
20 value range being measured (not full range of meter) and have been calibrated within the last year. All
21 equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or
22 damaged. Calibration tags shall be affixed or certificates readily available.

23 **PART 3 - EXECUTION**

24 **3.1 COMMISSIONING TEAM**

- 25
- 26 A. The members of the commissioning team consist of the Commissioning Authority (CxA), the Owner's Project
27 Manager (PM), the designated representative of the Owner's Construction Management team (CM), the General
28 Contractor (GC or Contractor), the architect and design engineers, the Mechanical Contractor, the Electrical
29 Contractor, the TAB Contractor, the Controls Contractor, any other installing subcontractors or suppliers of
30 equipment.
- 31 1. Members Appointed by Owner:
- 32 a. CxA: The designated person, company, or entity that plans, schedules, and coordinates
33 the commissioning team to implement the commissioning process
- 34 b. Representatives of the facility user and operation and maintenance personnel
- 35 c. Owners representative
- 36 d. Architect and engineering design professionals
- 37 2. Members Appointed by Contractor(s): Members Appointed by Contractor(s): Individuals, each
38 having the authority to act on behalf of the entity he or she represents, explicitly organized to
39 implement the commissioning process through coordinated action. The commissioning team shall
40 consist of, but not be limited to, the Construction Manager (CM) and representatives of the
41 Contractor, including Project superintendent and subcontractors, installers, suppliers, and
42 specialists deemed appropriate by the CxA
- 43 B. Each Cx Team member shall designate one person who is responsible for coordinating the commissioning efforts
44 with the CxA.

45 **3.2 SCHEDULING AND MEETINGS**

- 46
- 47 A. Scheduling: The CxA will work with the other members of the Cx Team according to established protocols to
48 schedule the Cx activities. The CxA will provide sufficient notice to the Cx Team for scheduling Cx activities. The
49 GC will integrate all Cx activities into the master schedule. All parties will address scheduling problems and make
50 necessary notifications in a timely manner in order to expedite the Cx process.
- 51 B. The CxA will provide the initial schedule of primary Cx events at the Cx pre-construction meeting. The Cx Plan
52 provides a format for this schedule. As construction progresses more detailed schedules are developed by the
53 CxA. The Cx Plan also provides a format for detailed schedules.
- 54 C. Scoping Meeting: Within 90 days of commencement of construction, the CxA will schedule, plan and conduct a
55 commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be
56 distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the
57 Commissioning Plan to its "final" version, which will also be distributed to all parties.
- 58

- 1 D. Miscellaneous Meetings: The Cx meetings will be scheduled approximately once a month during construction.
2 These meetings will be scheduled directly before or after the regular construction meetings if practical. These
3 meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will
4 plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be held
5 monthly or weekly as required or as the end of construction draws closer.
6

7 **3.3 REPORTING**

- 8 A. The CxA will provide regular reports to the Owner as construction and Cx progresses. Standard forms are
9 provided and referenced in the Cx Plan.
10 B. The CxA will regularly communicate with all members of the Cx team, keeping them apprised of Cx progress and
11 scheduling changes through memos, progress reports, etc.
12 C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and
13 testing as described in later sections.
14 D. A final summary report by the CxA will be provided to the CM and OR. All acquired documentation, logs,
15 minutes, reports, deficiency lists, communications, findings, unresolved issues, Prefunctional checklists,
16 functional tests, monitoring reports, etc will be compiled in appendices and provided with the summary report
17

18 **3.4 RECORD DRAWINGS**

- 19 A. The CxA will verify that the record drawings are updated throughout the construction. If a discrepancy is found
20 between the record drawings and the installations, the CxA will notify the GC immediately. It is the GC and
21 subcontractors responsibility to then inspect the installations and immediately and completely update the record
22 drawings such that they accurately reflect the installation.
23

24 **3.5 SUBMITTALS**

- 25 A. At minimum, the submittals for commissioned equipment shall include the manufacturer and model number,
26 the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data,
27 performance data, any performance test procedures, control drawings and details of owner contracted tests. In
28 addition, the installation and checkout materials that are actually shipped inside the equipment and the actual
29 field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning
30 Authority. All documentation requested by the CxA will be included by the Subs in their O&M manual
31 contributions. The CxA may provide appropriate contractors with specific requests for the type of submittal
32 documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the
33 normal submittal process and protocol of the construction team.
34 B. The submittals requested by the CxA are listed in Table 1 at the end of this Section.
35 C. The Commissioning Authority will review and provide comment on submittals related to the commissioned
36 equipment for conformance to the Contract Documents as it relates to the commissioning process, to the
37 functional performance of the equipment and adequacy for developing test procedures. This review is intended
38 primarily to aid in the development of functional testing procedures and only secondarily to verify compliance
39 with equipment specifications. The Commissioning Authority will notify the CM, Owner Representative, or A/E
40 as requested, of items missing or areas that are not in conformance with Contract Documents and which require
41 resubmission.
42 D. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the
43 completeness of the design intent documentation and sequences provided with the Specifications.
44 E. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals
45 are the responsibility of the Contractor, though the CxA will review and approve them.
46 F. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not
47 relieved by the Commissioning Authority's review.
48

49 **3.6 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT**

- 50 A. The following procedures apply to all equipment to be commissioned, according to Section 01 91 00, Part 1,
51 subsection 1.5, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic
52 machinery, e.g., electrical system power quality, may have very simplified prefunctional checklists and startup.
53 B. General. Prefunctional checklists are important to ensure that the equipment and systems are connected and
54 operational. This ensures that functional performance testing (in-depth system checkout) may proceed without
55 unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are
56 used. The prefunctional testing for a given system must be successfully completed prior to formal functional
57 performance testing of equipment or subsystems of the given system.

- 1 C. Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for startup
2 of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this
3 process is to ensure that there is written documentation that each of the manufacturer-recommended
4 procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in
5 the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional
6 performance tests are identified in the testing requirements in the applicable Division Sections.
- 7 3. The CxA adapts, if necessary, representative prefunctional checklists and procedures based on
8 requirements in the specifications for startup and initial checkout of the systems and the party
9 responsible for their execution.
- 10 4. The checklists and tests are provided by the CxA to the Contractor. The Contractor determines
11 which trade is responsible for executing and documenting each of the line item tasks and notes
12 that trade on the form. Each form may have more than one trade responsible for its execution. A
13 sample checklist is provided at the end of this specification section.
- 14 5. The subcontractor responsible for the purchase of the equipment develops the full start-up plan
15 by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and
16 checkout procedures from the O&M manual and the normally used field checkout sheets. The
17 plan will include checklists and procedures with specific boxes or lines for recording and
18 documenting the checking and inspections of each procedure and a summary statement with a
19 signature block at the end of the plan. The full start-up plan could consist of something as simple
20 as:
- 21 a. The CxA's prefunctional checklists.
22 b. The manufacturer's standard written start-up procedures copied from the installation
23 manuals with check boxes by each procedure and a signature block added by hand at the
24 end.
25 c. The manufacturer's normally used field checkout sheets.
- 26 6. The subcontractor submits the full startup plan to the CxA for review and approval.
27 7. The CxA reviews and approves the procedures and the format for documenting them, noting any
28 procedures that need to be added.
29 8. The full start-up procedures and the approval form may be provided to the CM for review and
30 approval, depending on management protocol.
- 31 D. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the CM, GC and CxA. The
32 performance of the prefunctional checklists, startup and checkout are directed and executed by the Sub or
33 vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of
34 completion of their work.
- 35 E. The CxA may observe the procedures for each piece of equipment, unless there are multiple units, (in which case
36 a sampling strategy may be used).
- 37 F. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a
38 sampling of the prefunctional and start-up procedures.
- 39 G. The Subs and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed
40 start-up and prefunctional tests and checklists.
- 41 H. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist
42 was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill
43 out these forms.
- 44 I. Deficiencies, Non-Conformance and Approval in Checklists and Startup.
- 45 1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional
46 procedures that were not completed successfully, at the bottom of the procedures form or on an
47 attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA
48 within two days of test completion.
- 49 2. The CxA reviews the report and submits either a non-compliance report or an approval form to
50 the Sub or CM. The CxA shall work with the Subs and vendors to correct and retest deficiencies or
51 uncompleted items. The CxA will involve the CM and others as necessary. The installing Subs or
52 vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a
53 timely manner and shall notify the CxA as soon as outstanding items have been corrected and
54 resubmit an updated start-up report and a Statement of Correction on the original non-
55 compliance report. When satisfactorily completed, the CxA recommends approval of the
56 execution of the checklists and startup of each system to the CM using a standard form.
- 57 3. Items left incomplete, which later cause deficiencies or delays during functional testing may result
58 in back charges to the responsible party. Refer to Part 3.7 herein for details.

3.7 FUNCTIONAL PERFORMANCE TESTING

- A. This sub-section applies to all commissioning functional testing for all divisions.
- B. The general list of equipment to be commissioned is found in Section 1.7. The specific equipment and modes to be tested are described in the Cx Plan.
- C. The parties responsible to execute each test are listed with each test in the Cx Plan.
- D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
 - 1. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.
 - 2. Development of Test Procedures. Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the A/E for review, if requested.
 - 3. The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.
 - 4. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
 - 5. The test procedure forms developed by the CxA shall include (but not be limited to) the following information:
 - a. System and equipment or component name(s)
 - b. Equipment location and ID number
 - c. Date
 - d. Project name
 - e. Participating parties
 - f. Formulas used in any calculations
 - g. Required pre-test field measurements
 - h. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
 - i. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 - j. A section for comments
 - k. Signatures and date block for the CxA
 - l. A sample Functional Performance Test form is provided at the end of this specification section.
- E. Building Automation System Trending.
 - 1. To enable comprehensive testing through trend data analysis, the contractor shall provide the CxA with the following:
 - a. A complete points list of all systems and components accessible by the Building Automation System, including BAS addresses, point descriptions, measured units, and corresponding design-drawing point names;
 - b. A controls schematic for all systems and components, including sensor point designations;
 - c. A sample trend data file generated by the BAS, fulfilling the requirements in section 3.7.E.1.d

- 1 d. Trend data files, for all system points selected by the CxA, according to the following
- 2 requirements:
- 3 1) All data should be saved, where possible, in one file. If not feasible, then
- 4 on as few files as possible.
- 5 2) The data must be arranged in rows and columns
- 6 3) Clear date and time stamps for each data recording
- 7 4) The sampling rate must be constant, every 5 minutes.
- 8 5) All data recordings must be from the same time period.
- 9 6) Data point names must be clearer shown.
- 10 2. Where applicable, the above-mentioned Building Automation System Trending requirements may
- 11 be adjusted according to coordination with the CxA.
- 12 F. Test Methods.
- 13 1. Functional performance testing and verification may be achieved by manual testing (persons
- 14 manipulate the equipment and observe performance) or by monitoring the performance and
- 15 analyzing the results using the control system's trend log capabilities or by stand-alone
- 16 dataloggers. The CxA may substitute specified methods or require an additional method to be
- 17 executed, other than what was specified, with the approval of the CM. This may require a change
- 18 order and adjustment in charge to the Owner. The CxA will determine which method is most
- 19 appropriate for tests that do not have a method specified.
- 20 2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed,
- 21 though timing the testing to experience actual conditions is encouraged wherever practical.
- 22 3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the
- 23 outside air temperature reading in a control system to be something other than it really is, shall
- 24 be allowed, but shall be used with caution and avoided when possible. Such testing methods
- 25 often can only test a part of a system, as the interactions and responses of other systems will be
- 26 erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by
- 27 heating the outside air sensor with a hair blower rather than overwriting the value or by altering
- 28 the appropriate setpoint to see the desired response. Before simulating conditions or overwriting
- 29 values, sensors, transducers and devices shall have been calibrated.
- 30 4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate
- 31 transducers and DDC constants is generally recommended over using the sensor to act as the
- 32 signal generator via simulated conditions or overwritten values.
- 33 5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is
- 34 difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC
- 35 compressor lockout work at an outside air temperature below 55F, when the outside air
- 36 temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current
- 37 outside air temperature.
- 38 6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed
- 39 only after visually and directly verifying and documenting, over the range of the tested
- 40 parameters, that the indirect readings through the control system represent actual conditions and
- 41 responses. Much of this verification is completed during prefunctional testing.
- 42 7. Setup. Each function and test shall be performed under conditions that simulate actual conditions
- 43 as close as is practically possible. The Sub executing the test shall provide all necessary materials,
- 44 system modifications, etc. to produce the necessary flows, pressures, temperatures, etc.
- 45 necessary to execute the test according to the specified conditions. At completion of the test, the
- 46 Sub shall return all affected building equipment and systems, due to these temporary
- 47 modifications, to their pre-test condition.
- 48 8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be
- 49 functionally tested using a sampling strategy. Significant application differences and significant
- 50 sequence of operation differences in otherwise identical equipment invalidates their common
- 51 identity. A small size or capacity difference, alone, does not constitute a difference. It is noted
- 52 that no sampling by Subs is allowed in prefunctional checklist execution.
- 53 a. A common sampling strategy, the "xx% Sampling—yy% Failure Rule", is defined by the
- 54 following example.
- 55 b. xx = the percent of the group of identical equipment to be included in each sample.
- 56 c. yy = the percent of the sample that if failing, will require another sample to be tested.
- 57 d. The example below describes a 20% Sampling—10% Failure Rule.

- 1) Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample.”
 - 2) If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
 - 3) If 10% of the units in the second sample fail, test all remaining units in the whole group.
 - 4) If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.
- G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the CM, GC and affected Subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.
1. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional performance testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.
- H. Test Equipment. Refer to Section 019113, Part 2 for test equipment requirements.
- I. Problem Solving. The CxA may recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.8 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 Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Construction 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 (0.1 degree C) 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 (150 mm) of the site sensor.
 2. Verify that the sensor reading, via the permanent thermostat, gage 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 conform 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 (150 mm) of the site sensor.

10. Verify that the sensor reading, via the permanent thermostat, gage 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 (0.2 degree C).
 4. Relative Humidity: 4 percent of design.
 5. Barometric Pressure: 0.1 inch of Hg (340 Pa).
 6. Flow Rate, Air: 10 percent of design.
 7. Flow Rate, Water: 4 percent of design.
 8. Flow Rate, Steam: 3 percent of design.
 9. AHU Wet Bulb and Dew Point: 2.0 degrees F (1.1 degrees C).
 10. Hot Water Coil and Boiler Water Temperature: 1.5 degrees F (0.8 degrees C).
 11. Cooling Coil, Chilled and Condenser Water Temperatures: 0.4 degrees F (0.2 degree C).
 12. Combustion Flue Temperature: 5.0 degrees F (2.8 degrees C).
 13. Oxygen and CO2 Monitors: 0.1 percentage points.
 14. CO Monitor: 0.01 percentage points.
 15. Natural Gas and Oil Flow Rate: 1 percent of design.
- 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
- 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.

3.9 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL

- A. Documentation. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM for review and approval and to the Subs for review. The CxA will include the filled out forms in the O&M manuals.
- B. Non-Conformance.
 1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM on a standard non-compliance form.
 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the CM.
 4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.
 - a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
 - 1) The CxA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CxA submits the non-compliance reports to the CM for signature, if required. A copy is provided to the Sub and CxA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.

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- 2) The CxA reschedules the test and the test is repeated.
 - 3) If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - 4) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the CM and to the Sub representative assumed to be responsible.
 - 5) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Project Manager.
 - 6) The CxA documents the resolution process.
 - 7) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
5. Cost of Retesting.
 - a. The cost for the Sub to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.
 - b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA and CM will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CxA's and CM's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.
 - c. The time for the CxA and CM to direct any retesting required because a specific prefunctional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.
 - d. Refer to the sampling section of Section 019113, Part 3.6 for requirements for testing and retesting identical equipment.
 6. The Contractor shall respond in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
 7. The CxA retains the original non-conformance forms until the end of the project.
 8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.
- C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CM or OR. In such case, the Contractor shall provide the Owner with the following:
1. Within one week of notification from the CM or OR, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM or OR within two weeks of the original notice.
 2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
 3. The CM or OR will determine whether a replacement of all identical units or a repair is acceptable.
 4. Two examples of the proposed solution will be installed by the Contractor and the CM will be allowed to test the installations for up to one week, upon which the CM or OR will decide whether to accept the solution.
 5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

- 1 D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the
2 functional performance test is made later after review by the CxA and by the CM, if necessary. The CxA
3 recommends acceptance of each test to the CM using a standard form. The CM gives final approval on each test
4 using the same form, providing a signed copy to the CxA and the Contractor.
5

6 3.9 DEFERRED TESTING

- 7 A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required
8 occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon
9 approval of the OR. These tests will be conducted in the same manner as the seasonal tests as soon as possible.
10 Services of necessary parties will be negotiated.
11 B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer
12 to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests
13 will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the
14 CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.
15

16 3.10 TRAINING OF OWNER PERSONNEL

- 17 A. The CM shall be responsible for training coordination and scheduling and ultimately for ensuring that training is
18 completed.
- 19 1. The CxA shall be responsible for overseeing and approving the content and adequacy of the
20 training of Owner personnel for commissioned equipment.
 - 21 2. The CxA shall interview the facility manager and lead engineer to determine the special needs and
22 areas where training will be most valuable. The Owner and CxA shall decide how rigorous the
23 training should be for each piece of commissioned equipment. The CxA shall communicate the
24 results to the Subs and vendors who have training responsibilities.
 - 25 3. In addition to these general requirements, the specific training requirements of Owner personnel
26 by Subs and vendors are specified in the Cx Plan.
 - 27 4. Each Sub and vendor responsible for training will submit a written training plan to the CxA for
28 review and approval prior to training. The plan will cover the following elements:
 - 29 a. Equipment (included in training)
 - 30 b. Intended audience
 - 31 c. Location of training
 - 32 d. Objectives
 - 33 e. Subjects covered (description, duration of discussion, special methods, etc.)
 - 34 f. Duration of training on each subject
 - 35 g. Instructor for each subject
 - 36 h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations,
37 written handouts, etc.)
 - 38 i. Instructor and qualifications
 - 39 j. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion
40 of the control of the equipment during the mechanical or electrical training conducted by
41 others.
 - 42 k. Means of training documentation (i.e. report, sign-in sheet, video recording, manual, etc).
 - 43 5. The CM/GC develops an overall training plan and coordinates and schedules, with the Owner and
44 CxA, the overall training for the commissioned systems. The CxA develops criteria for determining
45 that the training was satisfactorily completed, including attending some of the training, etc. The
46 CxA recommends approval of the training to the CM using a standard form. The CM also signs the
47 approval form at one of the training sessions; the CxA discusses the use of the blank functional
48 test forms for re-commissioning equipment.
 - 49 6. Video recording of the training sessions will be provided by the Trade Contractor with media
50 cataloged by the CM/GC and added to the O&M manuals.
 - 51 7. Training shall include presentation of the overall system concept and the concept of each
52 equipment section. This presentation shall include a review of all systems using the simplified
53 system schematics.
54

55 3.11 OPERATION AND MAINTENANCE MANUALS

- 56 A. Standard O&M Manuals.
- 57 1. The specific content and format requirements for the standard O&M manuals are detailed in the
58 Cx Plan and in Section 017823.

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- 2. Contractor shall submit at least an electronic copy of the complete operating and maintenance manual to the CM for review by the CxA.
 - 3. CxA Review and Approval. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builds for systems that were commissioned to verify compliance with the Specifications. The CxA will communicate deficiencies in the manuals to the CM, OR or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the CM, OR or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E's contract.
- B. Commissioning Record in O&M Manuals.
 1. The CxA is responsible to compile, organize and index the commissioning data and deliver it to the GC, to be included with the O&M manuals.
 2. Final Report Details. The final commissioning report shall include an executive summary, overview of commissioning and testing scope and a general description of testing and verification methods. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.
 3. Other documentation will be retained by the CxA

3.12 SYSTEMS MANUAL

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- A. The GC and applicable Subs must supply the following documentation for inclusion in the systems manuals each commissioned system:
 1. As-built system single line diagrams
 2. As-built sequences of operations, control drawings, and original set points
 3. Operating instructions for integrated building systems
 4. Recommended schedule of maintenance requirements and frequency for equipment
 5. Recommended schedule for calibrating sensors and actuators
 - B. Prior to substantial completion, the applicable subcontractors shall submit an electronic copy of this documentation for their respective works to the CM for review by the CxA.

3.13 WRITTEN WORK PRODUCTS

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- A. The commissioning process generates several written work products described in various parts of the Specifications. In summary, the written products are:

<u>Product</u>	<u>Developed By</u>
1. Final commissioning plan	CxA
2. Cx meeting minutes	CxA
3. Commissioning schedules	CxA, GC, CM
4. Equipment documentation submittals	Subs
5. Prefunctional checklists	CxA
6. Startup and initial checkout plan	Subs, CxA (existing documents)
7. Startup and initial checkout forms filled out	Subs
8. Final TAB report	TAB
9. Issues log (deficiencies)	CxA
10. Deficiency Reports	CxA
11. Functional performance test forms	CxA
12. Completed functional performance test forms	CxA
13. O&M Manuals	Subs
14. Overall training plan	GC, CM
15. Specific training agendas	Subs
16. Final commissioning report	CxA
17. Miscellaneous approvals	CxA

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3.8 SAMPLE DOCUMENTS

A. The two documents after this section (Sample Construction Checklist and Sample System Performance Test) are included to demonstrate the level of effort and quality expected of the contractors. These documents will be revised as necessary as the project progresses.

END OF SECTION

**SECTION 01 91 19
BUILDING ENCLOSURE COMMISSIONING**

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23
24 **PART 1 - GENERAL**

25 **1.1 WORK INCLUDES**

- 26 A. Base Bid
27 1. General Contractor
28 a. Assign representatives with expertise and authority to act on its behalf and shall schedule them to partici-
29 pate in and perform commissioning process activities.
30 b. Provide field quality control testing and inspections on exterior enclosure construction (including filling
31 out commissioning checklists) and submit reports to the Commissioning Agent.
32 c. Participate in testing/inspection procedures meetings.
33 d. Direct appropriate subcontractors to correct deficiencies as interpreted by the Commissioning Agent, De-
34 signer, and OWNER.
35 e. During construction, maintain as built redline drawings for all drawings.
36 f. Coordinate with manufacturers to determine specific requirements to maintain the validity of the warran-
37 ty.
38 g. Provide input for final commissioning documentation to the Commissioning Agent.
39 h. Submit operation and maintenance data for systems, subsystems, and components to the Commissioning
40 Agent.
41 i. Participate in maintenance orientation, training, and inspection.
42 j. Complete paper or electronic construction checklists as work is completed and provide to the CxA on a
43 weekly basis.
44 k. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of
45 the Using Agency to keep warranties in force.

- 1 l. Assist in equipment testing per agreements with General Contractor.
- 2 m. Provide all special tools and instruments (only available from vendor, specific to a piece of equipment) re-
- 3 quired for testing equipment according to these Contract Documents in the base bid price to the Contrac-
- 4 tor, except for stand-alone data logging equipment that may be used by the CxA.

5 **1.2 RELATED WORK**

- 6 A. Specified Elsewhere
- 7 2. Section 01 91 00 "Commissioning" for commissioning process activities.

8 **1.3**

A/E	Architect and design engineers	FMD	Facility Management Depart.
CxA	Commissioning Agent	HC	Heating Contractor
DN	Design Narrative	BECxA	Building Envelope CxA
Cx	Commissioning	OWNER	Owner Representative
Cx Plan	Commissioning Plan document	PM	Project Manager (of the OWNER)
GC	General Contractor	RFI	Request for Information
EC	Electrical contractor	Subs	Subcontractors to General
FPT	Functional Performance Test		

9 **SUMMARY**

- 10 A. This Section includes exterior enclosure commissioning procedures, including substructure, superstructure, exterior enclo-
- 11 sure, and roofing construction that protects climate controlled interior space from unconditioned spaces and the exterior
- 12 environment.
- 13 B. Commissioning
- 14 1. A systematic process ensuring that all building enclosure systems perform interactively according to the Archi-
- 15 tect’s DN and the OPR. This is to be achieved through actual verification of systems performance during the
- 16 construction period.
- 17 2. The commissioning process does not take away from, or reduce the responsibility of, the General Contractor
- 18 and installing subcontractors to provide a finished and fully functioning product.
- 19 3. Whole building commissioning includes heating, ventilation, electrical, and plumbing commissioning agents and
- 20 building enclosure commissioning agents. This specification only addresses building enclosure commissioning.
- 21 C. Building Envelope/Enclosure Commissioning Service Procurement: The OWNER shall retain a Building Envelope Commis-
- 22 sioning Agent (BECxA), who will oversee the commissioning of all building enclosure components.
- 23 D. Systems to be Commissioned: Sections of work to be commissioned are listed in the Cx Plan (reference Section 01 91 00
- 24 Commissioning).
- 25 E. Description: The steps involved in building enclosure commissioning and the services provided by the Building Envelope
- 26 Commissioning Agent (BECxA) are described in the Cx Plan. (reference Section 01 91 10 Commissioning)
- 27 F. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan. Defini-
- 28 tions are found in Section 1.3.
- 29 G. Related Requirements:
- 30 1. Section 01 91 00 "Commissioning"

31 **1.4 DEFINITIONS**

- 32 A. Acceptance Phase: Phase of construction after startup and initial checkout when functional performance tests,
- 33 O&M documentation review and training occurs.
- 34 B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the
- 35 tested modes according to the Contract Documents.
- 36 C. Architect/Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team, gen-
- 37 erally the HVAC heating and ventilation designer/engineer and the electrical designer/engineer.
- 38 D. DN: Design Narrative. A document that records concepts, calculations, decisions, and product selections used to
- 39 meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes
- 40 both narrative descriptions and lists of individual items that support the design process.

- 1 E. CxA: Commissioning Agent. An independent agent, not otherwise associated with the A/E team members or the
2 Contractor, hired by the OWNER. The CxA directs and coordinates the day-to-day commissioning activities.
- 3 F. Cx Plan: Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and
4 documentation requirements of the commissioning process.
- 5 G. Data Logging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers sepa-
6 rate from the control system.
- 7 H. Deferred Functional Tests: FPTs that are performed later, after substantial completion, due to partial occupancy,
8 equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.
- 9 I. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in
10 compliance with the Contract Documents (that is, does not perform properly or is not complying with the design in-
11 tent)
- 12 J. Design Intent: A dynamic document that provides the explanation of the ideas, concepts and criteria that are consid-
13 ered to be very important to the OWNER. It is initially the outcome of the programming and conceptual design
14 phases.
- 15 K. Design Narrative or Design Documentation: Sections of either the Design Intent or Design Narrative.
- 16 L. Factory Testing: Testing of equipment on-site or at the factory-by-factory personnel with Owner representative
17 present.
- 18 M. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using
19 manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather
20 than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to
21 see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under vari-
22 ous modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying out-
23 side air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequenc-
24 es of operation and components are verified to be responding as the sequences state. Traditional air or water test
25 and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting
26 up the system flows, and pressures as specified, while functional testing is verifying that which has already been set
27 up. The Commissioning Agent develops the functional test procedures in a sequential written form, coordinates,
28 oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FPTs
29 are performed after prefunctional checklists and startup are complete.
- 30 N. General Contractor (GC): The prime contractor for this project. Generally, refers to all the GC's subcontractors as
31 well. Also referred to as the Contractor, in some contexts.
- 32 O. Indirect Indicators: Indicators of a response or condition, such as a reading from a control system screen reporting a
33 damper to be 100% closed.
- 34 P. Manual Test: Using hand-held instruments, immediate control system readouts or direct observation to verify per-
35 formance (contrasted to analyzing monitored data taken over time to make the "observation").
- 36 Q. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data-
37 loggers or the trending capabilities of control systems.
- 38 R. Non-Compliance: See Deficiency.
- 39 S. Non-Conformance: See Deficiency.
- 40 T. Over-written Value: Writing over a sensor value in the control system to see the response of a system (e.g., chang-
41 ing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."
- 42 U. OPR: Owner Project Requirements. A document that details the functional requirements of a project and the ex-
43 pectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost
44 considerations, benchmarks, success criteria, and supporting information. For clarity, the OPR here refers to the
45 OWNER project requirements.
- 46 V. Pre-Functional Checklist (PC): A list of items to inspect and elementary component tests to conduct to verify proper
47 installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections
48 and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels af-
49 fixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of
50 the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-
51 phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Pre-functional
52 checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning
53 process, contractors typically perform some, if not many, of the prefunctional checklist items a Commissioning
54 Agent will recommend. However, few contractors document in writing the execution of these checklist items.

- 1 Therefore, for most equipment, the contractors execute the checklists on their own. The Commissioning Agent only
2 requires that the procedures be documented in writing, and does not witness much of the prefunctional checklist,
3 except for larger or more critical pieces of equipment.
- 4 W. Sampling: Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.
5 X. Seasonal Performance Tests: FPTs that are deferred until the system(s) will experience conditions closer to their
6 design conditions.
- 7 Y. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying a
8 hair blower to a space sensor to see the response in a VAV box).
- 9 Z. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure
10 to the transducer and DDC system to simulate a sensor value.
- 11 AA. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall
12 mean "as-built" systems, subsystems, equipment, and components.
- 13 BB. Startup: The initial starting or activating of dynamic equipment, including executing prefunctional checklists.
14 CC. Subs: The subcontractors to the GC who provide and install building components and systems.
15 DD. Test Procedures: The step-by-step process which must be executed to fulfill the test requirements. The test pro-
16 cedures are developed by the CxA.
- 17 EE. Test Requirements: Requirements specifying what modes and functions, etc. shall be tested. The test require-
18 ments are not the detailed test procedures. The test requirements are specified in the Contract Documents
- 19 FF. Trending: Monitoring using the building control system.
- 20 GG. Vendor: Supplier of equipment.
- 21 HH. Warranty Period: Warranty period for entire project, including equipment components. Warranty begins at Sub-
22 substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Docu-
23 ments and accepted submittals.

24 1.5 COORDINATION

- 25 A. Commissioning Team. The members of the commissioning team consist of the Commissioning Agent (CxA), the
26 Owner Representative, the designated representative of the Owner Construction Management firm (CM), the Gen-
27 eral Contractor (GC or Contractor), the architect and design engineers (particularly the heating and ventilation engi-
28 neers), the Heating Contractor (HC), the Ventilation Contractor (VC), the Electrical Contractor (EC), and any other in-
29 stalling subcontractors or suppliers of equipment. If known, the Owner building or plant operator/engineer is also a
30 member of the commissioning team.
- 31 B. Management. The CxA is hired by the OWNER directly. The CxA directs and coordinates the commissioning activi-
32 ties and the reports to the OWNER. All members work together to fulfill their contracted responsibilities and meet
33 the objectives of the Contract Documents.
- 34 C. Scheduling. The CxA will work with the GC according to established protocols to schedule the commissioning activi-
35 ties. The CxA will provide sufficient notice to the GC for scheduling commissioning activities. The GC will integrate
36 all commissioning activities into the master schedule. All parties will address scheduling problems and make neces-
37 sary notifications in a timely manner in order to expedite the commissioning process.
- 38 D. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting.
39 The Commissioning Plan provides a format for this schedule. As construction progresses, more detailed schedules
40 are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

41 1.6 COMMISSIONING PROCESS

- 42 A. Commissioning Plan. The Commissioning Plan, provided as part of the bid documents, is binding on the Contractor.
43 The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial
44 commissioning scoping meeting the CxA will update the plan which is then considered the "final" plan, though it will
45 continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commis-
46 sioning Plan.
- 47 B. Commissioning Process. See the Commissioning Plan for an overview of the commissioning tasks during construc-
48 tion and the order in which they occur.

1 **1.7 COMMISSIONING TEAM**

- 2 A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she
3 represents, explicitly organized to implement the commissioning process through coordinated action. The commis-
4 sioning team shall consist of, but not be limited to, the General Contractor (GC) and representatives of the Contrac-
5 tor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate
6 by the CxA.
- 7 B. Members Appointed by OWNER:
- 8 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning
9 team to implement the commissioning process.
- 10 2. Representatives of the facility user and operation and maintenance personnel.
- 11 3. The OWNERS Representative.
- 12 4. Architect and engineering design professionals.

13 **1.8 OWNER RESPONSIBILITIES**

- 14 A. Provide the OPR documentation to the CxA and Contractor for information and use.
- 15 B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- 16 C. Provide the DN documentation, prepared by Architect, and approved by OWNER, to the CxA and Contractor for use
17 in developing the commissioning plan, systems manual, and operation and maintenance training plan.
- 18 D. Follow the Commissioning Plan.
- 19 E. Attend commissioning scoping meetings and additional meetings as necessary.

20 **1.9 ARCHITECT/ENGINEERS (AE) RESPONSIBILITIES**

- 21 A. The AE shall participate in and perform commissioning process activities including the following:
- 22 1. Attend the commissioning scoping meeting and selected commissioning team meetings.
- 23 2. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual prepa-
24 ration, etc., as contracted.
- 25 B. Provide paper and electronic copies of Project Drawings and specifications to the Commissioning Agent.
- 26 C. Attend the commissioning scoping meeting and selected commissioning team meetings.
- 27 D. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual prepara-
28 tion, etc., as contracted.
- 29 E. Provide any design narrative and sequence documentation requested by the CxA. The designers shall assist (along
30 with the contractors) in clarifying the operation and control of the building enclosure component in areas where
31 the specifications, drawings or documentation is not sufficient for writing detailed testing procedures.
- 32 F. Participate in testing/inspection procedures meetings.
- 33 G. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
34 Provide written responses to design review comments from the Commissioning Agent or other parties as request-
35 ed.
- 36 H. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and ap-
37 prove the O&M manuals.
- 38 I. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commis-
39 sioning of which the Commissioning Agent and Contractor may disagree.

40 **1.10 GENERAL CONTRACTOR'S RESPONSIBILITIES (or "PRIME CONTRACTOR", IF APPLICABLE)**

- 41 A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to
42 participate in and perform commissioning process activities including the following:
- 43 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for
44 system and equipment installation, recommend corrective action.
- 45 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
- 46 3. Attend commissioning team meetings held as needed.
- 47 4. Integrate and coordinate commissioning process activities with construction schedule.

- 1 5. Review commissioning progress and deficiency reports.
- 2 6. Review and accept construction checklists provided by the CxA.
- 3 B. Provide Coordination Drawings (see Section 1.12 Building Enclosure Coordination Documents) showing the complete
- 4 coordination and integration of all work of commissioned envelope systems to the Commissioning Agent.
- 5 C. Provide cut sheets and Shop Drawings Submittals of commissioned systems to the Commissioning Agent.
- 6 D. Attend Preconstruction, Design, and Construction Phase building enclosure coordination meetings.
- 7 E. Provide Test Data, Letters of Compatibility, and Certificates to the Commissioning Agent.
- 8 F. Coordinate trades in accordance with the requirements in the General Conditions and General Requirements of the
- 9 Construction Contract.
- 10 G. Permit and provide access to locations of installed systems, subsystems, and components for testing and inspection
- 11 H. Review test procedures to ensure feasibility, safety and equipment protection and provide necessary written limits
- 12 to be used during tests.
- 13 I. Provide schedule and accommodate field quality control tests and inspections required by the Contract Documents
- 14 and product manufacturers to the Commissioning Agent.
- 15 J. Upgrade schedule biweekly throughout the construction period.
- 16 K. Provide field quality control testing and inspections on exterior enclosure construction (including filling out commis-
- 17 sioning checklists) and submit reports to the Commissioning Agent.
- 18 L. Participate in testing/inspection procedures meetings.
- 19 M. Direct appropriate subcontractors to correct deficiencies as interpreted by the Commissioning Agent, Designer, and
- 20 OWNER.
- 21 N. During construction, maintain as built redline drawings for all drawings.
- 22 O. Coordinate with manufacturers to determine specific requirements to maintain the validity of the warranty.
- 23 P. Provide input for final commissioning documentation to the Commissioning Agent.
- 24 Q. Submit operation and maintenance data for systems, subsystems, and components to the Commissioning Agent
- 25 R. Participate in maintenance orientation, training, and inspection.

26 **1.11 SUB CONTRACTOR'S RESPONSIBILITIES**

- 27 A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construc-
- 28 tion scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-
- 29 conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The
- 30 primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document per-
- 31 formance—that systems are functioning in accordance with the documented design intent and in accordance with
- 32 the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and function-
- 33 ally test equipment and systems.
- 34 1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized docu-
- 35 mentation, clear and regular communications and consultations with all necessary parties, frequently updated
- 36 timelines and schedules and technical expertise.
- 37 2. Coordinate the commissioning work and, with the GC, ensure that commissioning activities are being sched-
- 38 uled into the master schedule.
- 39 3. Revise, as necessary, the Commissioning Plan.
- 40 4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
- 41 B. Incorporate commissioning requirements into the Construction Documents via a commissioning specification.
- 42 C. Initial review of preliminary Construction Documents against OPR and DN.
- 43 D. Perform back check review of Construction Documents against OPR and DN.
- 44 E. Develop functional Test Plan for exterior enclosure.
- 45 F. Review of Project Drawings and Specifications at 50%, and 100% completion for constructability, durability, and per-
- 46 formance of exterior enclosure conformance.
- 47 G. Review of pertinent building enclosure Shop Drawings/Submittals for compliance with
- 48 H. Observe the construction and testing of mockups (if applicable).
- 49 I. Document construction of commissioned components at the completion of mockup testing. This documentation will
- 50 consist of graphic representation of mockup details for use in revising shop drawings as needed (if applicable).
- 51 J. Attend pertinent Progress Meetings (as needed).
- 52 K. Perform field observations of exterior enclosure installations.

- 1 L. Maintain a log of deficient conditions.
- 2 M. Observe functional field performance (in-situ) testing.
- 3 N. Evaluate substitution requests for compliance with Contract Documents and for compatibility with work of other
- 4 subcontractors.
- 5 O. Compile test data, inspection reports, and certificates and include them in the Systems Manual and Commissioning
- 6 Process Report.
- 7 P. Recommend resolution of conflicts in the installation of materials and assemblies specific to the building enclosure
- 8 trades.
- 9 Q. Finalize Commissioning Record with warranties and closeout documentation.
- 10 R. Verify applicable training procedures of building maintenance personnel.

11 **1.12 BUILDING ENCLOSURE COORDINATION DOCUMENTS**

- 12 A. The General Contractor shall be fully responsible for coordinating all trades, assuring proper construction sequences
- 13 and schedules, and coordinating the actual installed location and interface of all work that impacts the building en-
- 14 closure. Before materials are fabricated or the work begun, the General Contractor shall supervise and direct the
- 15 creation of one set of Coordination Drawings showing the complete coordination and integration of all work of this
- 16 Project relating to the thermal, drainage, air barrier, vapor barrier, and waterproofing systems of enclosure. Coord-
- 17 ination Drawings are intended to assist the General Contractor during construction, and may be produced using
- 18 Architect's drawings, shop drawings, or other drawings as needed to communicate coordination requirements to
- 19 all concerned subcontractors. Specifically, Coordination Drawings shall include, but are not limited to the following
- 20 detail conditions and system connections. See applicable divisions for further requirements.
- 21 1. Cold fluid applied water proofing
- 22 2. Thermal insulation
- 23 3. Weather barriers
- 24 4. Fluid applied membrane air barriers
- 25 5. Metal composite wall panel joints
- 26 6. Preformed metal siding
- 27 7. Joint sealants
- 28 8. TPO roofing
- 29 9. Sheet metal flashing and trim
- 30 10. Roof accessories
- 31 11. Roof-to-wall metal flashing terminations
- 32 12. Roof-to-wall flashing conditions at all locations
- 33 13. Precast concrete panel tie-in to adjacent waterproofing/air barrier membranes
- 34 14. Roofing system penetrations
- 35 15. Flashing at fenestrations and doors

36 **1.13 FUNCTIONAL PERFORMANCE TESTING (IN-SITU)**

- 37 A. Objectives and Scope: The objective of functional performance testing is to demonstrate that each building enclo-
- 38 sure/assembly system is operating according to the documented design intent of the Contract Documents and in
- 39 accordance with the OPR. Functional testing facilitates bringing the material assembly from a state of substantial
- 40 completion to full operation. Additionally, during the testing process, areas of non-compliant performance are iden-
- 41 tified and corrected, improving the operation, and function of the building enclosure/assemblies.
- 42 B. Development of Test Plans: The subcontractors / testing agents shall develop project-specific test plans for each
- 43 building enclosure/assembly to meet the testing requirements including pass criteria and schedule as specified in
- 44 Part 3.2 of this section (01 91 19). Prior to execution, the BECxA shall review the test plans.
- 45 1. The test plans shall include, but not be limited to the following:
- 46 a. Who will perform the test?
- 47 b. Specific locations and sampling rates
- 48 c. Prerequisites to be fulfilled before the testing
- 49 d. Test set-up procedures
- 50 e. Passing criteria

- 1 2. The BECxA shall observe contractor-provided performance testing.
- 2 3. The General Contractor, according to the requirements / direction of the Testing Agent, shall construct or ar-
- 3 range for construction of test chambers and shall provide staging and access equipment as needed to position
- 4 spray racks at the exterior.
- 5 4. The purpose of any given specific test is to verify and document compliance with the stated criteria of the Con-
- 6 struction Documents.
- 7 C. Test Methods
- 8 1. Functional performance testing and verification will typically follow ASTM industry standards. The subcontract-
- 9 tor will determine which method is most appropriate for tests and modify test methods when an existing indus-
- 10 try method is not available or applicable.
- 11 2. Simulated Conditions: Simulating conditions may be allowed as needed, though testing actual conditions is en-
- 12 couraged wherever practical.
- 13 D. Coordination and Scheduling: The General Contractor and their subcontractors shall provide sufficient notice to the
- 14 Commissioning Agent regarding their completion schedule for the functional checklists and construction of the as-
- 15 semblies or building enclosure systems. The General Contractor will schedule functional tests with the BECxA and
- 16 affected subcontractors.
- 17 E. In general, functional testing is conducted after mockup testing has been satisfactorily completed.
- 18 F. Problem Solving: The BECxA may recommend solutions to problems found, however, the burden of responsibility to
- 19 solve, correct, and retest problems is with the contractor responsible for the installation of the tested assembly.
- 20 G. Failed tests will typically result in additional testing of the failed specimen. The cost of re-staging and constructing
- 21 test chamber shall be responsibility of the deficient contractor. Costs for subsequent retests due to failure shall be
- 22 the responsibility of the deficient contractor. Test will be concluded only when satisfactory results are achieved.
- 23 H. Non-Conformance:
- 24 1. The subcontractor will record the results of the functional tests in a written report. All deficiencies or non-
- 25 conformance issues shall be noted and reported.
- 26 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the BECxA. In
- 27 such cases, the deficiency and resolution will be documented in the written report.
- 28 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not com-
- 29 promising the integrity of the procedures.
- 30 4. As tests progress and a deficiency is identified, the issues are discussed with the executing Contractor.
- 31 a. When there is no dispute on the deficiency and the subcontractor accepts responsibility to correct it:
- 32 1) The BECxA documents the deficiency and the subcontractor's response and intentions and work pro-
- 33 ceeds.
- 34 2) The BECxA will coordinate the rescheduled test with the affected Contractor, and the test is repeated.
- 35 3) Work associated with any envelope system or component that fails testing will immediately cease until
- 36 testing non-conformances/failure are corrected, and re-testing proves successful.
- 37 b. If there is a dispute about a deficiency regarding whether it is a deficiency or who is responsible:
- 38 1) The deficiency shall be documented on the Non-Compliance Form with the subcontractor's response and
- 39 copy give to the General Contractor and to the subcontractor's representative assumed to be responsi-
- 40 ble.
- 41 2) Resolutions are made at the lowest management level possible. Other parties are brought into the dis-
- 42 cussions as needed. Interpretive authority is with the A/E. Final acceptance authority is with the PM.
- 43 3) The BECxA documents the resolution process.
- 44 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency,
- 45 signs the Statement of Correction on the Non- Compliance form, and provides it to the BECxA. The
- 46 General Contractor shall reschedule the test with the affected Contractors, and the test(s) are repeated
- 47 until satisfactory performance is achieved.
- 48 5) Any required retesting that is a result of deficient installation shall not be considered a justified reason
- 49 for a claim of delay or for a time extension by the Contractor.
- 50 6) Work associated with any envelope system or component that fails testing will immediately cease until
- 51 testing non-conformances/failure are corrected, and re-testing proves successful.
- 52 7) Deficiencies identified through inspections and/or testing are to be corrected by the executing Contractor
- 53 at their expense.

1 **Part 2 - PRODUCTS (NOT USED)**

2 **Part 3 - EXECUTION**

3 **3.1 MEETINGS**

- 4 A. Scoping Meeting. Within 90 days of commencement of construction, the CxA will schedule, plan and conduct a
5 commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be dis-
6 tributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the Commis-
7 sioning Plan to its “final” version, which will also be distributed to all parties.
- 8 B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses.
9 These meetings will cover coordination, deficiency resolution and planning issues with particular Subcontractors.
10 The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be
11 held monthly or weekly as required or as the end of construction draws closer.

12 **3.2 ONSITE TESTING**

- 13 A. All labor, materials, and testing equipment for building enclosure test preparation, execution, and re-testing to be
14 provided by contractor as part of base bid.
- 15 B. This section includes a summary of all required enclosure testing (not excluding inspections).
- 16 A. Testing Standards:
- 17 1. ASTM E 1186-03, (Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier
18 System.) Section 4.2.7 (Chamber Depressurization in Conjunction with Leak Detection Liquid.)
- 19 1) Applicable Sections:
- 20 a) **07 27 26 – Fluid-Applied Membrane Air Barriers**
- 21 b) **07 54 23 – TPO Roofing**
- 22 2) Test Schedule: After all specified coats of fluid barrier applied or membrane adhered and manufac-
23 turer’s required curing time has elapsed, before installation of exterior continuous insulation
- 24 3) Test Quantity: 2 sets of 25 per barrier type, as directed by Owner, BCxP, and Architect
- 25 4) Pass Criteria: no visible bubbles in the testing fluid
- 26 2. ASTM D 4541-95, (Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Test-
27 ers.)
- 28 1) Applicable Sections:
- 29 a) **07 27 26 – Fluid-Applied Membrane Air Barriers**
- 30 2) Test Schedule: After all specified coats of air barrier are applied and cured, before the installation of
31 exterior cladding.
- 32 3) Test Quantity: Minimum 3 locations per barrier type, as directed by Owner, BCxP, and Architect
- 33 4) Pass Criteria: 5% greater than manufacturer’s stated ultimate elongation
- 34 3. AAMA 501.2, (Quality Assurance and Diagnostic Water Leakage Field Check)
- 35 1) Applicable Sections:
- 36 a) **07 42 13.23 – Metal Composite Material Wall Panels**
- 37 b) **08 45 23 – Fiberglass Sandwich Panel Wall System**
- 38 c) **08 41 13 – Aluminum-Framed Entrances and Storefronts**
- 39 2) Test Schedule: At 10% and 50% installation completion, prior to installation of interior finishes, per-
40 forming out of sequence work as required to facilitate testing schedule.
- 41 3) Test Quantity: 200’ linear per round (up to 400’ total), as directed by Owner, BCxP, and Architect.
- 42 4) Pass Criteria: No visible water intrusion.
- 43 4. ASTM E7877 (Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof
44 Membranes, low-voltage)
- 45 1) Applicable Sections:
- 46 a) **07 14 16 – Cold Fluid-Applied waterproofing**
- 47 b) **07 54 23 – TPO Roofing**
- 48 2) Test Schedule: At 10% TPO membrane installation completion, after membrane adhered, joints
49 taped/waterproofed, and manufacturer’s required curing time has elapsed, before installation of ex-
50 terior continuous insulation
- 51 3) Test Quantity: 2 tests, as directed by Owner, BCxP, and Architect

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- 4) Pass Criteria: No leaks detected
 5. ASTM D 8231 – 19, (Standard Practice for the Use of a Low Voltage Electronic Scanning System for Detecting and Locating Breaches in Roofing and Waterproofing Membranes)
 - a) **07 54 23 – TPO Roofing**
 - 2) Test Schedule: At 100% TPO membrane installation completion, after membrane adhered, joints taped/waterproofed, and manufacturer’s required curing time has elapsed, before installation of exterior continuous insulation
 - 3) Test Quantity: 1 test
 - 4) Pass Criteria: No leaks detected
 6. ASTM C1193, Method A (Field-Applied Sealant Joint Hand Pull Tab) – OR – ASTM C1521, Method A (Tape Procedure)
 - 1) Applicable Sections:
 - a) **07 92 00 – Joint Sealants**
 - 2) Test Schedule: After joint sealant applied and cured, before the installation of exterior cladding.
 - 3) Test Quantity: 10 tests for the first 1000’ of joint length for each unique combination of sealant and substrate, and 1 test per 1000’ thereafter.
 - 4) Pass Criteria: 5% greater than manufacturer’s stated ultimate elongation
 7. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) **Per Section 014350, Part 3.1.B.3.i)**
 - 1) Applicable Sections:
 - a) **08 11 13 – Hollow Metal Doors (exterior doors only)**
 - b) **08 33 23 – Overhead Coiling Doors**
 - c) **08 36 00 – Sectional Overhead Doors**
 - d) **08 41 13 – Aluminum-Framed Entrances and Storefronts**
 - e) **08 42 29.23 – Sliding Automatic Entrances**
 - 2) Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total), performing out of sequence work as required to facilitate testing schedule.
 - 3) Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect
 - 4) Pass Criteria:
 - a) Storefront: 0.15 cfm/sf at 6.27 PSF test pressure
 - b) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure
 - c) Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure
 8. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
 - 1) Applicable Sections:
 - a) **08 11 13 – Hollow Metal Doors (exterior doors only)**
 - b) **08 31 23 – Coiling Overhead Doors**
 - c) **08 36 00 – Sectional Overhead Doors**
 - d) **08 41 13 – Aluminum-Framed Entrances and Storefronts**
 - e) **08 42 29.23 – Sliding Automatic Entrances**
 - 2) Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total), performing out of sequence work as required to facilitate testing schedule.
 - 3) Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect
 - 4) Pass Criteria:
 - a) Storefront: 0.15 cfm/sf at 6.27 PSF test pressure
 - b) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure
 - c) Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure
 9. ASTM E 779, (Standard Test Method for Determining Air Leakage Rate by Fan Pressurization) – **OR** – ASTM E 1827 (Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door)
 - 1) Test Schedule: Perform test twice: (1) at mid-construction after completion of exterior air barrier, but prior to interior finishes to permit diagnosis upon test failure, performing out of sequence work as required to facilitate testing schedule. (1) just prior to substantial completion.
 - 2) Pass Criteria: 0.1 cfm / sqft at 50 Pa test pressure.

- 1 C. In case of discrepancy between testing specified in Section 01 91 19 and elsewhere in the project manual, the more
2 stringent requirement shall apply (e.g. if a test is specified elsewhere but not in Section 01 91 19 , the test is re-
3 quired shall be required; if a test is specified in Section 01 91 19 but not elsewhere, the test shall be required; if a
4 test is specified elsewhere without a specific quantity or schedule, and in this section with a specific quantity and
5 schedule, the requirement from Section 01 91 19 shall apply).

6 **3.3 REPORTING**

- 7 A. The CxA will communicate with all members of the commissioning team, keeping them apprised of commissioning
8 progress and scheduling changes through memos, progress reports, etc.
9 B. Testing or review approvals and non-conformance and deficiency reports are made with the review and testing as
10 described in later sections.
11 C. A final summary report by the CxA will be provided to the GC and OWNER. All acquired documentation, logs,
12 minutes, reports, deficiency lists, communications, findings, unresolved issues, Prefunctional checklists, functional
13 tests, monitoring reports, etc. will be compiled in appendices and provided with the summary report.

14 **END OF SECTION**

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**SECTION 01 91 01
MONITORING BASED COMMISSIONING**

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4 PART 1 – GENERAL 1

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PART 1 – GENERAL

1.1 SUMMARY

A. Purpose: This section includes general requirements that apply to implementation of measurement and verification.

B. RELATED WORK AND REQUIREMENTS

- 1. Section 01 31 13 Project Coordination
- 2. Section 01 31 19 Project Meetings
- 3. Section 01 31 23 Project Management Web Site
- 4. Section 01 91 00 Commissioning
- 5. Section 23 09 00 Instrumentation and Control for HVAC
- 6. Section 23 09 23 Direct Digital Control (DDC) System for HVAC
- 7. Section 23 09 93 Sequence of Operations for HVAC DDC
- 8. Section 26 24 13 Switchboards
- 9. Section 26 24 16 Panelboards

1.2 DEFINITIONS

- A. BAS - Building Automation System
- B. DHW - Domestic Hot Water
- C. MBCx - Monitoring Based Commissioning
- D. kW - Electric power read from utility meter
- E. KWh - Electric energy consumption read from utility meter
- F. Plug Loads – Electric power and consumption from wall receptacles

1.3 MECHANICAL CONTRACTOR RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform MBCX activities including, but not limited to, the following:
 - 1. Follow activities identified in the MBCX Plan.
 - 2. Coordinate connection of gas and DHW monitoring equipment with BAS.
 - 3. Cooperate with the MBCX Provider and Controls Contractor for resolution of issues related to data collection.
 - 4. Attend team meetings during construction and post-construction MBCX period (1 year).

1.4 ELECTRICAL CONTRACTOR RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform MBCX activities including, but not limited to, the following:
 - 1. Follow activities identified in the MBCX Plan.
 - 2. Coordinate connection of electrical monitoring equipment with BAS

- 3. Cooperate with the MBCX Provider and Controls Contractor for resolution of issues related to data collection.
- 4. Attend team meetings during construction and post-construction MBCX period (1 year).

1.5 CONTROLS CONTRACTOR RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform MBCX activities including, but not limited to, the following:
 - 1. Follow activities identified in the MBCX Plan.
 - 2. Coordinate connection of electrical, gas, and DHW monitoring equipment with BAS
 - 3. Cooperate with the MBCX Provider Mechanical Contractor and Electrical Contractor for resolution of issues related to establishing connection between BAS and monitoring meters and equipment.
 - 4. Attend team meetings during construction and post-construction MBCX period (1 year).
- B. Contractor to provide

1.6 MBCX PROVIDERS RESPONSIBILITIES

- A. Providers responsibilities include:
 - 1. Organize and lead the MBCX team.
 - 2. Provide MBCX plan.
 - 3. Convene MBCX meetings as needed.
 - 4. Cooperate with the Mechanical Contractor, Electrical Contractor, and Controls Contractor for resolution of issues related to establishing connection between BAS and monitoring meters and equipment.
 - 5. Provide an MBCX report at 1 year post construction.

PART 2 – PRODUCTS

2.1 METERS AND SUB-METERS

- A. Monitoring meters and sub-meters, both gas and electric, to have the ability to connect to the BAS and provide data to BAS at a minimum of 15 minute intervals. It is acceptable to use the utility for this purpose if allowable by utility company.

PART 3 - EXECUTION

3.1 METER

- A. Provide real-time monitoring of the whole building electricity kW and kWh use by using a signal from the building utility meter serving the HVAC, lighting, and plug loads and provide the data input to the Building Automation System (BAS). The BAS must be capable of trending this kW and kWh data. Data is to be collected in 15 minute intervals. Storage of at least 3 months of 15 minute data is required on the BAS. Data older than 3 months is to be automatically saved and archived on the BAS computer without being overwritten. Data older than 5 years can be overwritten. It is the responsibility of the electrical contractor to coordinate this work.

3.2 NATURAL GAS

- A. Provide real-time monitoring of whole building natural gas consumption by using a signal from the building utility meter to provide the data input to the BAS. The BAS must be capable of trending gas consumption. Data is to be collected in 15 minute intervals. Storage of at least 3 months of 15 minute data is required on the BAS. Data older than 3 months is to be automatically saved and archived on the BAS computer without being overwritten. Data older than 5 years can be overwritten. It is the responsibility of the mechanical contractor to coordinate this work.

3.3 DOMESTIC HOT WATER

- A. Provide real-time monitoring of the domestic hot water (DHW) system by measuring water flow to DHW heater and DHW supply and return temperatures and providing data input to the BAS. The BAS must be capable of trending gas consumption. Data is to be collected in 15 minute intervals. Storage of at least 3 months of 15 minute data is required on the BAS. Data older than 3 months is to be automatically saved and archived on the BAS computer without being overwritten. Data older than 5 years can be overwritten. It is the responsibility of the mechanical contractor to coordinate this work.

1 **3.4 TEMPORARY MONITORING**

2 A. Provide easy access to allow for the temporary installation of split-core current sensors and voltage sensors for
3 the electrical measurement and datalogging on the following systems:

- 4 1. Lighting
5 2. Plug loads
6 3. HVAC equipment including chillers, fans, circulation pumps, and air handling units
7 4. DHW equipment
8

9 **3.5 DDC TRENDS**

10 A. The Controls Contractor is to provide provision for remote access to BAS to view status of building and the ability
11 to download trendable points. BAS provision must allow for bulk export/download of BAS trends at 15 minute
12 intervals across a period of 1 month (minimum).
13

14 **END OF SECTION**

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**SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES**

3 **PART 1 - GENERAL**

4 **1.1 RELATED DOCUMENTS**

- 5 A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01
6 Specification Sections, apply to this Section.

7 **1.2 SUMMARY**

- 8 A. Section Includes:
9 1. Form-facing material for cast-in-place concrete.
10 2. Shoring, bracing, and anchoring.
11 B. Related Requirements:
12 1. Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.

13 **1.3 DEFINITIONS**

- 14 A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and
15 gaining sufficient strength to be self-supporting.
16 B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the
17 concrete, as well as supporting members, hardware, and necessary bracing.

18 **1.4 PREINSTALLATION MEETINGS**

- 19 A. Preinstallation Conference: Conduct conference at Project site.
20 1. Review the following:
21 a. Special inspection and testing and inspecting agency procedures for field quality control.
22 b. Construction, movement, contraction, and isolation joints
23 c. Forms and form-removal limitations.
24 d. Shoring and reshoring procedures.
25 e. Anchor rod and anchorage device installation tolerances.

26 **1.5 ACTION SUBMITTALS**

- 27 A. Product Data: For each of the following:
28 1. Exposed surface form-facing material.
29 2. Concealed surface form-facing material.
30 3. Form ties.
31 4. Waterstops.
32 5. Form-release agent.
33 B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their
34 preparation, detailing fabrication, assembly, and support of forms.
35 1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
36 2. Indicate dimension and locations of construction and movement joints required to construct the structure
37 in accordance with ACI 301.
38 a. Location of construction joints is subject to approval of the Architect.
39 3. Indicate location of waterstops.
40
41 4. Indicate form liner layout and form line termination details.
42 5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation
43 and removal.
44 6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.
45 C. Samples:

1 1. For waterstops.

2 **1.6 INFORMATIONAL SUBMITTALS**

- 3 A. Qualification Data: For testing and inspection agency.
- 4 B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance
- 5 Criteria AC353.
- 6 C. Field quality-control reports.
- 7 D. Minutes of preinstallation conference.

8 **1.7 QUALITY ASSURANCE**

- 9 A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077
- 10 and ASTM E329 for testing indicated.

11 **1.8 DELIVERY, STORAGE, AND HANDLING**

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

13 **PART 2 - PRODUCTS**

14 **2.1 PERFORMANCE REQUIREMENTS**

- 15 A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in
- 16 accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might
- 17 be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines,
- 18 and dimensions.
 - 19 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 20 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of
 - 21 supports.
 - 22 a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of
 - 23 form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).
- 24 B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to
- 25 support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can
- 26 support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 27 1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:
 - 28 a. Wind Loads: As indicated on Drawings.
 - 29 1) Horizontal Deflection Limit: Not more than **1/240** of the wall height.

30 **2.2 FORM-FACING MATERIALS**

- 31 A. As-Cast Surface Form-Facing Material:
 - 32 1. Provide continuous, true, and smooth concrete surfaces.
 - 33 2. Furnish in largest practicable sizes to minimize number of joints.
 - 34 3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000
 - 35 "Cast-In-Place Concrete, and as follows:
 - 36 a. Plywood, metal, or other approved panel materials.
 - 37 b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as
 - 38 follows:
 - 39 1) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
- 40 B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
 - 41 1. Provide lumber dressed on at least two edges and one side for tight fit.
- 42 C. Board Formed Concrete: Rough hemlock, 6-inch wide planks, oriented horizontally.

1 **2.3 WATERSTOPS**

- 2 A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic
3 polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

4 **2.4 RELATED MATERIALS**

- 5 A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face
6 opening of reglet to prevent intrusion of concrete or debris.
7 B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors.
8 Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
9 C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
10 D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely
11 affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
12 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
13 2. Form release agent for form liners shall be acceptable to form liner manufacturer.
14 E. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to
15 resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
16 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
17 2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
18 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

19 **PART 3 - EXECUTION**

20 **3.1 INSTALLATION OF FORMWORK**

- 21 A. Comply with ACI 301.
22 B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position
23 indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section
24 033000 "Cast-In-Place Concrete" for as-cast finishes.
25 C. Limit concrete surface irregularities as follows:
26 1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
27 D. Construct forms tight enough to prevent loss of concrete mortar.
28 1. Minimize joints.
29 2. Exposed Concrete: Symmetrically align joints in forms.
30 E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
31 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
32 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
33 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
34 F. Do not use rust-stained, steel, form-facing material.
35 G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in
36 finished concrete surfaces.
37 1. Provide and secure units to support screed strips
38 2. Use strike-off templates or compacting-type screeds.
39 H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
40 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
41 2. Locate temporary openings in forms at inconspicuous locations.
42 I. Chamfer exterior corners and edges of permanently exposed concrete.
43 J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
44 K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
45 1. Determine sizes and locations from trades providing such items.
46 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
47 L. Construction and Movement Joints:
48 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
49 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by
50 Architect.
51 3. Place joints perpendicular to main reinforcement.

- 1 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
- 2 a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder
- 3 intersection.
- 4 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top
- 5 of footings or floor slabs.
- 6
- 7 6. Space vertical joints in walls as indicated on Drawings.
- 8 a. Locate joints beside piers integral with walls, near corners, and in concealed locations where
- 9 possible.
- 10 M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
- 11 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to
- 12 drain.
- 13 2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly
- 14 fitted, so joints will not be apparent in exposed concrete surfaces.
- 15 N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just
- 16 before placing concrete.
- 17 O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper
- 18 alignment.
- 19 P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before
- 20 placing reinforcement.

21 3.2 INSTALLATION OF EMBEDDED ITEMS

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

32 3.3 INSTALLATION OF WATERSTOPS

- 33 A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings,
- 34 according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing
- 35 into place.
- 36 1. Install in longest lengths practicable.
- 37 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
- 38 3. Protect exposed waterstops during progress of the Work.

39 3.4 REMOVING AND REUSING FORMS

- 40 A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of
- 41 concrete may be removed after cumulatively curing at not less than 50 deg F for **24** hours after placing concrete.
- 42 Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection
- 43 operations need to be maintained.
- 44 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of
- 45 concrete in place until concrete has achieved **at least 70 percent** of its 28-day design compressive strength.
- 46 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or
- 47 disturbing shores.
- 48 B. Clean and repair surfaces of forms to be reused in the Work.
- 49 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed
- 50 surfaces.
- 51 2. Apply new form-release agent.

- 1 C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
- 2 1. Align and secure joints to avoid offsets.
- 3 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

4 **3.5 SHORING AND RESHORING INSTALLATION**

- 5 A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
- 6 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- 7 B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such
- 8 a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members
- 9 without sufficient steel reinforcement.
- 10 C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate
- 11 reshoring to support construction without excessive stress or deflection.

12 **3.6 FIELD QUALITY CONTROL**

- 13 A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit
- 14 reports.

15 **END OF SECTION**

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**SECTION 03 20 00
CONCRETE REINFORCING**

1
2

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Steel reinforcement bars.
- 7 2. Welded-wire reinforcement.
- 8 B. Related Requirements:
- 9 1. Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.
- 10 **1.2 PREINSTALLATION MEETINGS**
- 11 A. Preinstallation Conference: Conduct conference at **Project site**.
- 12 1. Review the following:
- 13 a. Special inspection and testing and inspecting agency procedures for field quality control.
- 14 b. Construction contraction and isolation joints.
- 15 c. Steel-reinforcement installation.

16 **1.3 ACTION SUBMITTALS**

- 17 A. Product Data: For the following:
- 18 1. Each type of steel reinforcement.
- 19 2. Epoxy repair coating.
- 20 3. Bar supports.
- 21 B. Shop Drawings: Comply with ACI SP-066:
- 22 1. Include placing drawings that detail fabrication, bending, and placement.
- 23 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar
- 24 arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of
- 25 welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- 26 3. For structural thermal break insulated connection system, indicate general configuration, insulation
- 27 dimensions, tension bars, compression pads, shear bars, and dimensions.
- 28 C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
- 29 1. Location of construction joints is subject to approval of Architect.

30 **1.4 INFORMATIONAL SUBMITTALS**

- 31 A. Welding certificates.
- 32 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.
- 33 B. Material Certificates: For each of the following, signed by manufacturers:
- 34 1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- 35 C. Material Test Reports: For the following, from a qualified testing agency:
- 36 1. Steel Reinforcement:
- 37 a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent
- 38 of the steel in accordance with ASTM A706/A706M.
- 39 D. Field quality-control reports.
- 40 E. Minutes of preinstallation conference.

41 **1.5 QUALITY ASSURANCE**

- 42 A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329
- 43 for testing indicated.
- 44 B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1 **1.6 DELIVERY, STORAGE, AND HANDLING**

- 2 A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage **and to avoid**
3 **damaging coatings on steel reinforcement.**
4 1. Store reinforcement to avoid contact with earth.
5 2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being
6 stored under an opaque covering.

7 **PART 2 - PRODUCTS**

8 **2.1 STEEL REINFORCEMENT**

- 9 A. Reinforcing Bars: ASTM A615/A615M, **Grade 60**, deformed.
10 B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.
11 C. Epoxy-Coated Reinforcing Bars:
12 1. Steel Bars: **ASTM A615/A615M, Grade 60**, deformed bars.
13 2. Epoxy Coating: **ASTM A775/A775M** with less than 2 percent damaged coating in each 12-inch bar length.
14 D. Steel Bar Mats: ASTM A184/A184M, fabricated from **ASTM A615/A615M, Grade 60** or **ASTM A706/A706M**,
15 deformed bars, assembled with clips.
16 E. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat
17 sheets.
18 F. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
19 G. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, **plain** steel.

20 **2.2 REINFORCEMENT ACCESSORIES**

- 21 A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of
22 burrs.
23 B. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, ASTM A775/A775M epoxy coated.
24 C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and
25 welded-wire reinforcement in place.
26 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of
27 Standard Practice," of greater compressive strength than concrete and as follows:
28 a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI
29 Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar
30 supports.
31 b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated
32 wire bar supports.
33 D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
34 1. Finish: **Plain**.
35 E. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and
36 complying with ASTM A775/A775M.

37 **2.3 FABRICATING REINFORCEMENT**

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

39 **PART 3 - EXECUTION**

40 **3.1 PREPARATION**

- 41 A. Protection of In-Place Conditions:
42 1. Do not cut or puncture vapor retarder.
43 2. Repair damage and reseal vapor retarder before placing concrete.
44 B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to
45 concrete.

- 1 **3.2 INSTALLATION OF STEEL REINFORCEMENT**
- 2 A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- 3 B. Accurately position, support, and secure reinforcement against displacement.
 - 4 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 5 2. Do not tack weld crossing reinforcing bars.
- 6 C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3
- 7 times size of large aggregate, whichever is greater.
- 8 D. Provide concrete coverage in accordance with ACI 318.
- 9 E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- 10 F. Splices: Lap splices as indicated on Drawings.
 - 11 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices,
 - 12 or 24 inches, whichever is greater.
 - 13 2. Stagger splices in accordance with ACI 318.
- 14 G. Install welded-wire reinforcement in longest practicable lengths.
 - 15 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - 16 a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 17 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for
 - 18 deformed wire.
 - 19 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 20 4. Lace overlaps with wire.
- 21 H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with
- 22 ASTM D3963/D3963M.

- 23 **3.3 JOINTS**
- 24 A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as
- 25 approved by Architect.
 - 26 1. Place joints perpendicular to main reinforcement.
 - 27 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 28 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- 29 B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-
- 30 half of dowel length, to prevent concrete bonding to one side of joint.

- 31 **3.4 INSTALLATION TOLERANCES**
- 32 A. Comply with ACI 117.

- 33 **3.5 FIELD QUALITY CONTROL**
- 34 A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit
- 35 reports.

36 **END OF SECTION**

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**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

1
2

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.
- 7 B. Related Requirements:
- 8 1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating
9 concrete forms, and waterstops.
- 10 2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
- 11 3. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
- 12 4. Section 321313 "Concrete Paving" for concrete pavement and walks.

13 **1.2 DEFINITIONS**

- 14 A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended
15 hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with
16 requirements.
- 17 B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

18 **1.3 PREINSTALLATION MEETINGS**

- 19 A. Preinstallation Conference: Conduct conference at **Project site**.
- 20 1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including
21 the following:
- 22 a. Contractor's superintendent.
- 23 b. Independent testing agency responsible for concrete design mixtures.
- 24 c. Ready-mix concrete manufacturer.
- 25 d. Concrete Subcontractor.
- 26 e. Special concrete finish Subcontractor.
- 27 2. Review the following:
- 28 a. Special inspection and testing and inspecting agency procedures for field quality control.
- 29 b. Construction joints, control joints, isolation joints, and joint-filler strips.
- 30 c. Semirigid joint fillers.
- 31 d. Vapor-retarder installation.
- 32 e. Anchor rod and anchorage device installation tolerances.
- 33 f. Cold and hot weather concreting procedures.
- 34 g. Concrete finishes and finishing.
- 35 h. Curing procedures.
- 36 i. Forms and form-removal limitations.
- 37 j. Shoring and reshoring procedures.
- 38 k. Methods for achieving specified floor and slab flatness and levelness.
- 39 l. Floor and slab flatness and levelness measurements.
- 40 m. Concrete repair procedures.
- 41 n. Concrete protection.
- 42 o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- 43 p. Protection of field cured field test cylinders.

44 **1.4 ACTION SUBMITTALS**

- 45 A. Product Data: For each of the following.
- 46 1. Portland cement.

- 1 2. Fly ash.
- 2 3. Slag cement.
- 3 4. Blended hydraulic cement.
- 4 5. Silica fume.
- 5 6. Performance-based hydraulic cement
- 6 7. Aggregates.
- 7 8. Admixtures:
 - 8 a. Include limitations of use, including restrictions on cementitious materials, supplementary
 - 9 cementitious materials, air entrainment, aggregates, temperature at time of concrete placement,
 - 10 relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
- 11 9. Fiber reinforcement.
- 12 10. Vapor retarders.
- 13 11. Floor and slab treatments.
- 14 12. Curing materials.
- 15 13. Joint fillers.
- 16 14. Repair materials.
- 17 B. Design Mixtures: For each concrete mixture, include the following:
 - 18 1. Mixture identification.
 - 19 2. Minimum 28-day compressive strength.
 - 20 3. Durability exposure class.
 - 21 4. Maximum w/cm.
 - 22 5. Calculated equilibrium unit weight, for lightweight concrete.
 - 23 6. Slump limit.
 - 24 7. Air content.
 - 25 8. Nominal maximum aggregate size.
 - 26 9. Steel-fiber reinforcement content.
 - 27 10. Synthetic micro-fiber content.
 - 28 11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
 - 29 12. Intended placement method.
 - 30 13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test
 - 31 results, or other circumstances warrant adjustments.
- 32 C. Shop Drawings:
 - 33 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 34 a. Location of construction joints is subject to approval of the Architect.
- 35 D. Samples: For vapor retarder.
- 36 E. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including
- 37 the following:
 - 38 1. Concrete Class designation.
 - 39 2. Location within Project.
 - 40 3. Exposure Class designation.
 - 41 4. Formed Surface Finish designation and final finish.
 - 42 5. Final finish for floors.
 - 43 6. Curing process.

44 **1.5 INFORMATIONAL SUBMITTALS**

- 45 A. Material Certificates: For each of the following, signed by manufacturers:
 - 46 1. Cementitious materials.
 - 47 2. Admixtures.
 - 48 3. Fiber reinforcement.
 - 49 4. Curing compounds.
 - 50 5. Floor and slab treatments.
 - 51 6. Bonding agents.
 - 52 7. Adhesives.
 - 53 8. Vapor retarders.
 - 54 9. Semirigid joint filler.
 - 55 10. Joint-filler strips.
 - 56 11. Repair materials.

- 1 B. Material Test Reports: For the following, from a qualified testing agency:
- 2 1. Portland cement.
- 3 2. Fly ash.
- 4 3. Slag cement.
- 5 4. Blended hydraulic cement.
- 6 5. Silica fume.
- 7 6. Performance-based hydraulic cement.
- 8 7. Aggregates.
- 9 8. Admixtures:
- 10 a. Permeability-Reducing Admixture: Include independent test reports, indicating compliance with
- 11 specified requirements, including dosage rate used in test.
- 12 C. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.
- 13 D. Research Reports:
- 14 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
- 15 2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.
- 16 E. Preconstruction Test Reports: For each mix design.
- 17 F. Field quality-control reports.
- 18 G. Minutes of preinstallation conference.

19 **1.6 QUALITY ASSURANCE**

- 20 A. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and
- 21 ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
- 22 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and
- 23 Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified
- 24 Concrete Laboratory Testing Technician, Grade II.
- 25 B. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with
- 26 ASTM C1077 and ASTM E329 for testing indicated.
- 27 1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in
- 28 accordance with ACI CPP 610.1 or an equivalent certification program.

29 **1.7 PRECONSTRUCTION TESTING**

- 30 A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each
- 31 concrete mixture.
- 32 1. Include the following information in each test report:
- 33 a. Admixture dosage rates.
- 34 b. Slump.
- 35 c. Air content.
- 36 d. Seven-day compressive strength.
- 37 e. 28-day compressive strength.
- 38 f. Permeability.

39 **1.8 DELIVERY, STORAGE, AND HANDLING**

- 40 A. Comply with ASTM C94/C94M and ACI 301.

41 **1.9 FIELD CONDITIONS**

- 42 A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
- 43 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing
- 44 actions, or low temperatures.
- 45 2. When average high and low temperature is expected to fall below 40 deg F for three successive days,
- 46 maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
- 47 3. Do not use frozen materials or materials containing ice or snow.
- 48 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.

- 1 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators
2 unless otherwise specified and approved in mixture designs.
3 B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
4 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
5 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly
6 moist without standing water, soft spots, or dry areas.

7 **1.10 WARRANTY**

- 8 A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier
9 material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with
10 requirements or that fail to resist penetration by termites within specified warranty period.
11 1. Warranty Period: 10 years from date of Substantial Completion.

12 **PART 2 - PRODUCTS**

13 **2.1 CONCRETE, GENERAL**

- 14 A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

15 **2.2 CONCRETE MATERIALS**

- 16 A. Source Limitations:
17 1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
18 2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
19 3. Obtain aggregate from single source.
20 4. Obtain each type of admixture from single source from single manufacturer.
21 B. Cementitious Materials:
22 1. Portland Cement: ASTM C150/C150M, **Type I/II, gray.**
23 2. Fly Ash: ASTM C618, Class C or F.
24 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
25 4. Blended Hydraulic Cement: ASTM C595/C595M, **Type IS, portland blast-furnace slag** cement.
26 5. Silica Fume: ASTM C1240 amorphous silica.
27 C. Normal-Weight Aggregates: ASTM C33/C33M, **Class 3S** coarse aggregate or better, graded. Provide aggregates from
28 a single source.
29 1. Maximum Coarse-Aggregate Size: **1-1/2 inches** nominal.
30 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
31 D. Air-Entraining Admixture: ASTM C260/C260M.
32 E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute
33 water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or
34 admixtures containing calcium chloride **in steel-reinforced concrete.**
35 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
36 2. Retarding Admixture: ASTM C494/C494M, Type B.
37 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
38 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
39 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
40 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
41 F. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

42 **2.3 FIBER REINFORCEMENT**

- 43 A. Synthetic Macro-Fiber: Synthetic macro-fibers engineered and designed for use in concrete, complying with
44 ASTM C1116/C1116M, Type III, 1 to 2-1/4 inches long.

1 **2.4 VAPOR RETARDERS**

- 2 A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's
3 recommended adhesive or pressure-sensitive tape.

4 **2.5 CURING MATERIALS**

- 5 A. Water: Potable or complying with ASTM C1602/C1602M.
6 B. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

7 **2.6 RELATED MATERIALS**

- 8 A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or
9 self-expanding cork.
10 B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer
11 hardness of 80 in accordance with ASTM D2240.
12 C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

13 **2.7 REPAIR MATERIALS**

- 14 A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses
15 from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
16 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined
17 in ASTM C219.
18 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
19 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment
20 manufacturer.
21 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with
22 ASTM C109/C109M.
23 B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses
24 from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
25 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined
26 in ASTM C219.
27 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
28 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping
29 manufacturer.
30 4. Compressive Strength: Not less than **5000 psi** at 28 days when tested in accordance with
31 ASTM C109/C109M.

32 **2.8 CONCRETE MIXTURES, GENERAL**

- 33 A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial
34 mixture or field test data, or both, in accordance with ACI 301.
35 1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory
36 trial mixtures.
37 B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in
38 concrete as follows:
39 1. Fly Ash or Other Pozzolans: 25 percent by mass.
40 2. Slag Cement: 50 percent by mass.
41 3. Silica Fume: 10 percent by mass.
42 4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or
43 pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
44 5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not
45 exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
46 C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
47 1. Use water-reducing admixture in concrete, as required, for placement and workability.
48 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other
49 adverse placement conditions.

1 3. Use water-reducing admixture in pumped concrete.

2 **2.9 CONCRETE MIXTURES**

- 3 A. Class A Normal-weight concrete used for footings.
- 4 1. Exposure Class: ACI 318 F1 S0 W0 C0.
- 5 2. Minimum Compressive Strength: 3000 psi at 28 days.
- 6 3. Maximum w/cm: 0.45.
- 7 4. Slump Limit: 4 inches, plus or minus 1 inch.
- 8 5. Air Content:
- 9 a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing
- 10 1-1/2-inch nominal maximum aggregate size.
- 11 6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- 12 B. Class B: Normal-weight concrete used for foundation walls.
- 13 1. Exposure Class: ACI 318 F2 S0 W0 C0.
- 14 2. Minimum Compressive Strength: 4000 psi at 28 days.
- 15 3. Maximum w/cm: 0.45
- 16 4. Slump Limit: 4 inches, plus or minus 1 inch.
- 17 5. Air Content:
- 18 a. Exposure Classes F2: 6 percent, plus or minus 1.5 percent at point of delivery for concrete
- 19 containing 3/4-inch nominal maximum aggregate size.
- 20 6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- 21 C. Class C: Normal-weight concrete used for interior slabs-on-ground.
- 22 1. Exposure Class: ACI 318 F0 S0 W0 C0.
- 23 2. Minimum Compressive Strength: 4000 psi at 28 days.
- 24 3. Maximum w/cm: 0.45.
- 25 4. Slump Limit: 4 inches, plus or minus 1 inch.
- 26 5. Air Content:
- 27 a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete
- 28 used in trowel-finished floors.
- 29 6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- 30 7. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but
- 31 not less than a rate of 4.0 lb/cu. yd..
- 32 D. Class D: Normal-weight concrete used for exterior slabs on grade.
- 33 1. Exposure Class: ACI 318 F2 S0 W1 C2.
- 34 2. Minimum Compressive Strength: 4500 psi at 28 days.
- 35 3. Maximum w/cm: 0.45.
- 36 4. Slump Limit: 4 inches, plus or minus 1 inch.
- 37 5. Exposure Classes F2: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-
- 38 inch nominal maximum aggregate size Limit water-soluble, chloride-ion content in hardened concrete to
- 39 1.00 percent by weight of cement.
- 40 6. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but
- 41 not less than a rate of 4.0 lb/cu. yd..
- 42 E. Class E: Normal-weight concrete used for concrete toppings.
- 43 1. Exposure Class: ACI 318 F2 S0 W1 C2.
- 44 2. Minimum Compressive Strength: 4000 psi at 28 days.
- 45 3. Slump Limit: 4 inches, plus or minus 1 inch.
- 46 4. Air Content:
- 47 a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete
- 48 containing 3/4-inch nominal maximum aggregate size.
- 49 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- 50 6. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but
- 51 not less than a rate of 4.0 lb/cu. yd..
- 52 F. Class F: Normal-weight concrete used for interior metal pan stairs and landings:
- 53 1. Exposure Class: ACI 318 F0 S0 W0 C0.
- 54 2. Minimum Compressive Strength: 3000 psi at 28 days.
- 55 3. Maximum w/cm: 0.53.
- 56 4. Maximum Size Aggregate: 1/2 inch.

- 1 5. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
- 2 6. Air Content: 0 percent, plus or minus 0.5 percent at point of delivery.
- 3 7. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- 4 8. Retarding Admixture: Not allowed.
- 5 9. Accelerating Admixture: Not allowed.

6 **2.10 CONCRETE MIXING**

- 7 A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and
- 8 ASTM C1116/C1116M, and furnish batch ticket information.

9 **PART 3 - EXECUTION**

10 **3.1 EXAMINATION**

- 11 A. Verification of Conditions:
 - 12 1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and
 - 13 embedded items is complete and that required inspections have been performed.
 - 14 2. Do not proceed until unsatisfactory conditions have been corrected.

15 **3.2 PREPARATION**

- 16 A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency,
- 17 including the following:
 - 18 1. Daily access to the Work.
 - 19 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 20 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and
 - 21 continuous electrical power at Project site during site curing period for test samples.
 - 22 4. Security and protection for test samples and for testing and inspection equipment at Project site.

23 **3.3 INSTALLATION OF EMBEDDED ITEMS**

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

32 **3.4 INSTALLATION OF VAPOR RETARDER**

- 33 A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and
- 34 manufacturer's written instructions.
 - 35 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 - 36 2. Face laps away from exposed direction of concrete pour.
 - 37 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 - 38 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 39 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to
 - 40 floor slabs, grade beams, foundation walls, or pile caps.
 - 41 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 - 42 7. Protect vapor retarder during placement of reinforcement and concrete.
 - 43 a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6
 - 44 inches on all sides, and sealing to vapor retarder.

- 1 B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with
2 manufacturer's written instructions.

3 **3.5 JOINTS**

- 4 A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
5 B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
6 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as
7 approved by Architect.
8 2. Place joints perpendicular to main reinforcement.
9 a. Continue reinforcement across construction joints unless otherwise indicated.
10 b. Do not continue reinforcement through sides of strip placements of floors and slabs.
11 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
12 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum
13 distance of twice the beam width from a beam-girder intersection.
14 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top
15 of footings or floor slabs.
16 6. Space vertical joints in walls **as indicated on Drawings**. Unless otherwise indicated on Drawings, locate
17 vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
18 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened
19 concrete surfaces.
20 C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated.
21 Construct control joints for a depth equal to at least **one-fourth** of concrete thickness as follows:
22 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a
23 radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool
24 marks on concrete surfaces.
25 D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical
26 surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
27 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless
28 otherwise indicated on Drawings.
29 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete
30 surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
31 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip
32 sections together.

33 **3.6 CONCRETE PLACEMENT**

- 34 A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is
35 complete and that required inspections are completed.
36 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and
37 repair defective areas.
38 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to
39 damaged areas as Work progresses.
40 B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
41 C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in
42 writing, but not to exceed the amount indicated on the concrete delivery ticket.
43 D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but
44 not to exceed the amount indicated on the concrete delivery ticket.
45 E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed
46 on concrete that has hardened enough to cause seams or planes of weakness.
47 1. If a section cannot be placed continuously, provide construction joints as indicated.
48 2. Deposit concrete to avoid segregation.
49 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to
50 avoid inclined construction joints.
51 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
52 a. Do not use vibrators to transport concrete inside forms.

- 1 b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed
- 2 layer and at least 6 inches into preceding layer.
- 3 c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
- 4 d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and
- 5 complete embedment of reinforcement and other embedded items without causing mixture
- 6 constituents to segregate.
- 7 F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints,
- 8 until placement of a panel or section is complete.
- 9 1. Do not place concrete floors and slabs in a checkerboard sequence.
- 10 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement
- 11 and other embedded items and into corners.
- 12 3. Maintain reinforcement in position on chairs during concrete placement.
- 13 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
- 14 5. Level concrete, cut high areas, and fill low areas.
- 15 6. Slope surfaces uniformly to drains where required.
- 16 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before
- 17 excess bleedwater appears on the surface.
- 18 8. Do not further disturb slab surfaces before starting finishing operations.

19 **3.7 FINISHING FORMED SURFACES**

- 20 A. As-Cast Surface Finishes:
- 21 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
- 22 a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
- 23 b. Remove projections larger than 1 inch.
- 24 c. Tie holes do not require patching.
- 25 d. Surface Tolerance: ACI 117 Class D.
- 26 e. Apply to concrete surfaces not exposed to public view.
- 27 2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an
- 28 orderly and symmetrical manner with a minimum of seams.
- 29 a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
- 30 b. Remove projections larger than 1/4 inch.
- 31 c. Patch tie holes.
- 32 d. Surface Tolerance: ACI 117 Class B.
- 33 e. Locations: Apply to concrete surfaces exposed to public view.
- 34 3. ACI 301 Surface Finish SF-3.0:
- 35 a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
- 36 b. Remove projections larger than 1/8 inch.
- 37 c. Patch tie holes.
- 38 d. Surface Tolerance: ACI 117 Class A.
- 39 e. Locations: Apply to concrete surfaces exposed to public view or to be covered with a coating or
- 40 covering material applied directly to concrete.
- 41 B. Related Unformed Surfaces:
- 42 1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off
- 43 smooth and finish with a color and texture matching adjacent formed surfaces.
- 44 2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless
- 45 otherwise indicated.

46 **3.8 FINISHING FLOORS AND SLABS**

- 47 A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete
- 48 surfaces. Do not wet concrete surfaces.
- 49 B. Float Finish:
- 50 1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit
- 51 operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand
- 52 floating if area is small or inaccessible to power-driven floats.

- 1 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and
2 complies with ACI 117 tolerances for conventional concrete.
- 3 3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet
4 waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- 5 C. Trowel Finish:
 - 6 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 - 7 2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and
8 appearance.
 - 9 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 10 4. Do not add water to concrete surface.
 - 11 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 - 12 6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or
13 quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 14 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor
15 surface:
 - 16 a. Slabs on Ground:
 - 17 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values
18 of flatness, F_F 17; and of levelness, F_L 15.
- 19 D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed
20 by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom
21 perpendicular to main traffic route.
 - 22 1. Coordinate required final finish with Architect before application.
 - 23 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- 24 E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on
25 Drawings.
 - 26 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom
27 perpendicular to main traffic route.
 - 28 2. Coordinate required final finish with Architect before application.

29 **3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS**

- 30 A. Filling In:
 - 31 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise
32 indicated.
 - 33 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 - 34 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- 35 B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-
36 troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- 37 C. Equipment Bases and Foundations:
 - 38 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 39 2. Construct concrete bases **4 inches** high unless otherwise indicated on Drawings, and extend base not less
40 than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise
41 indicated on Drawings, or unless required for seismic anchor support.
 - 42 3. Minimum Compressive Strength: **3000 psi** at 28 days.
 - 43 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods
44 on 18-inch centers around the full perimeter of concrete base.
 - 45 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor
46 into structural concrete substrate.
 - 47 6. Prior to pouring concrete, place and secure anchorage devices.
 - 48 a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be
49 embedded.
 - 50 b. Cast anchor-bolt insert into bases.
 - 51 c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- 52 D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
 - 53 1. Cast-in inserts and accessories, as shown on Drawings.
 - 54 2. Screed, tamp, and trowel finish concrete surfaces.

1 **3.10 CONCRETE CURING**

- 2 A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- 3 1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
- 4 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
- 5 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and
- 6 during finishing operations.
- 7 B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
- 8 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
- 9 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
- 10 3. If forms remain during curing period, moist cure after loosening forms.
- 11 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
- 12 a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
- 13 b. Continuous Sprinkling: Maintain concrete surface continuously wet.
- 14 c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to
- 15 absorptive material to maintain concrete surface continuously wet.
- 16 d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material,
- 17 taping, or lapping seams.
- 18 e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or
- 19 roller in accordance with manufacturer's written instructions.
- 20 1) Recoat areas subject to heavy rainfall within three hours after initial application.
- 21 2) Maintain continuity of coating and repair damage during curing period.
- 22 C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
- 23 1. Begin curing immediately after finishing concrete.
- 24 2. Interior Concrete Floors:
- 25 a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the
- 26 following:
- 27 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without
- 28 marring concrete surface, install prewetted absorptive cover over entire area of floor.
- 29 a) Lap edges and ends of absorptive cover not less than 12 inches.
- 30 b) Maintain absorptive cover water saturated, and in place, for duration of curing
- 31 period, but not less than seven days.
- 32 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for
- 33 curing concrete, placed in widest practicable width, with sides and ends lapped at least 12
- 34 inches, and sealed by waterproof tape or adhesive.
- 35 a) Immediately repair any holes or tears during curing period, using cover material and
- 36 waterproof tape.
- 37 b) Cure for not less than seven days.
- 38 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for
- 39 not less than seven days, utilizing one, or a combination of, the following:
- 40 a) Water.
- 41 b) Continuous water-fog spray.
- 42 b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
- 43 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without
- 44 marring concrete surface, install prewetted absorptive cover over entire area of floor.
- 45 a) Lap edges and ends of absorptive cover not less than 12 inches.
- 46 b) Maintain absorptive cover water saturated, and in place, for duration of curing
- 47 period, but not less than seven days.
- 48 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for
- 49 curing concrete, placed in widest practicable width, with sides and ends lapped at least 12
- 50 inches, and sealed by waterproof tape or adhesive.
- 51 a) Immediately repair any holes or tears during curing period, using cover material and
- 52 waterproof tape.
- 53 b) Cure for not less than seven days.
- 54 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for
- 55 not less than seven days, utilizing one, or a combination of, the following:
- 56 a) Water.
- 57 b) Continuous water-fog spray.
- 58 c. Floors to Receive Polished Finish: Contractor has option of the following:

- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
- 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors to Receive Chemical Stain:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
- e. Floors to Receive Urethane Flooring:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
- f. Floors to Receive Curing Compound:
 - 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
- g. Floors to Receive Curing and Sealing Compound:
 - 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

41 **3.11 TOLERANCES**

- 42 A. Conform to ACI 117.

43 **3.12 APPLICATION OF LIQUID FLOOR TREATMENTS**

- 44 A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with
45 manufacturer's written instructions.
- 46 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 47 2. Do not apply to concrete that is less than **three** days' old.
 - 48 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming
49 or scrubbing.
 - 50 4. Rinse with water; remove excess material until surface is dry.
 - 51 5. Apply a second coat in a similar manner if surface is rough or porous.

- 1 **3.13 JOINT FILLING**
- 2 A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
- 3 1. Defer joint filling until concrete has aged at least **[one] [six]** month(s).
- 4 2. Do not fill joints until construction traffic has permanently ceased.
- 5 B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and
- 6 dry.
- 7 C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- 8 D. Overfill joint, and trim joint filler flush with top of joint after hardening.
-
- 9 **3.14 CONCRETE SURFACE REPAIRS**
- 10 A. Defective Concrete:
- 11 1. Repair and patch defective areas when approved by Architect.
- 12 2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- 13 B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate
- 14 passing a No. 16 sieve, using only enough water for handling and placing.
- 15 C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles,
- 16 honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that
- 17 cannot be removed by cleaning.
- 18 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any
- 19 dimension to solid concrete.
- 20 a. Limit cut depth to 3/4 inch.
- 21 b. Make edges of cuts perpendicular to concrete surface.
- 22 c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
- 23 d. Fill and compact with patching mortar before bonding agent has dried.
- 24 e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
- 25 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland
- 26 cement, so that, when dry, patching mortar matches surrounding color.
- 27 a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding
- 28 with patching.
- 29 b. Compact mortar in place and strike off slightly higher than surrounding surface.
- 30 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural
- 31 performance as determined by Architect.
- 32 D. Repairing Unformed Surfaces:
- 33 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each
- 34 surface.
- 35 a. Correct low and high areas.
- 36 b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
- 37 2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets,
- 38 crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through
- 39 unreinforced sections regardless of width, and other objectionable conditions.
- 40 3. After concrete has cured at least 14 days, correct high areas by grinding.
- 41 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting
- 42 out low areas and replacing with patching mortar.
- 43 a. Finish repaired areas to blend into adjacent concrete.
- 44 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
- 45 a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written
- 46 instructions to produce a smooth, uniform, plane, and level surface.
- 47 b. Feather edges to match adjacent floor elevations.
- 48 6. Correct other low areas scheduled to remain exposed with repair topping.
- 49 a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor
- 50 elevations.
- 51 b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written
- 52 instructions to produce a smooth, uniform, plane, and level surface.
- 53 7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and
- 54 replacing with fresh concrete.
- 55 a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-
- 56 inch clearance all around.

- 1 b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
- 2 c. Mix patching concrete of same materials and mixture as original concrete, except without coarse
- 3 aggregate.
- 4 d. Place, compact, and finish to blend with adjacent finished concrete.
- 5 e. Cure in same manner as adjacent concrete.
- 6 8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
- 7 a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose
- 8 particles.
- 9 b. Dampen cleaned concrete surfaces and apply bonding agent.
- 10 c. Place patching mortar before bonding agent has dried.
- 11 d. Compact patching mortar and finish to match adjacent concrete.
- 12 e. Keep patched area continuously moist for at least 72 hours.
- 13 E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- 14 F. Repair materials and installation not specified above may be used, subject to Architect's approval.

15 **3.15 FIELD QUALITY CONTROL**

- 16 A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit
- 17 reports.
- 18 1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying
- 19 that field-cured composite samples are cured in accordance with ASTM C31/C31M.
- 20 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of
- 21 Work to comply with Contract Documents.
- 22 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and
- 23 concrete manufacturer within 48 hours of inspections and tests.
- 24 a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301,
- 25 including the following as applicable to each test and inspection:
- 26 1) Project name.
- 27 2) Name of testing agency.
- 28 3) Names and certification numbers of field and laboratory technicians performing inspections
- 29 and testing.
- 30 4) Name of concrete manufacturer.
- 31 5) Date and time of inspection, sampling, and field testing.
- 32 6) Date and time of concrete placement.
- 33 7) Location in Work of concrete represented by samples.
- 34 8) Date and time sample was obtained.
- 35 9) Truck and batch ticket numbers.
- 36 10) Design compressive strength at 28 days.
- 37 11) Concrete mixture designation, proportions, and materials.
- 38 12) Field test results.
- 39 13) Information on storage and curing of samples before testing, including curing method and
- 40 maximum and minimum temperatures during initial curing period.
- 41 14) Type of fracture and compressive break strengths at seven days and 28 days.
- 42 B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating
- 43 quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of
- 44 batching, and amount of water that can be added at Project site.
- 45 C. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to
- 46 be performed in accordance with the following requirements:
- 47 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5
- 48 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
- 49 a. When frequency of testing provides fewer than five compressive-strength tests for each concrete
- 50 mixture, testing to be conducted from at least five randomly selected batches or from each batch if
- 51 fewer than five are used.
- 52 2. Slump: ASTM C143/C143M:
- 53 a. One test at point of placement for each composite sample, but not less than one test for each day's
- 54 pour of each concrete mixture.
- 55 b. Perform additional tests when concrete consistency appears to change.
- 56 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;

- 1 a. One test for each composite sample, but not less than one test for each day's pour of each concrete
2 mixture.
- 3 4. Concrete Temperature: ASTM C1064/C1064M:
4 a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for
5 each composite sample.
- 6 5. Compression Test Specimens: ASTM C31/C31M:
7 a. Cast and laboratory cure two sets of two 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens
8 for each composite sample.
9 b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite
10 sample.
- 11 6. Compressive-Strength Tests: ASTM C39/C39M.
12 a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28
13 days.
14 b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
15 c. A compressive-strength test to be the average compressive strength from a set of two specimens
16 obtained from same composite sample and tested at age indicated.
- 17 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders,
18 Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place
19 concrete.
- 20 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive
21 compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength
22 test value falls below specified compressive strength by more than 500 psi if specified compressive strength
23 is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if
24 specified compressive strength is greater than 5000 psi.
- 25 9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by
26 Architect but will not be used as sole basis for approval or rejection of concrete.
- 27 10. Additional Tests:
28 a. Testing and inspecting agency to make additional tests of concrete when test results indicate that
29 slump, air entrainment, compressive strengths, or other requirements have not been met, as
30 directed by Architect.
31 b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored
32 cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
33 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
- 34 11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of
35 replaced or additional work with specified requirements.
- 36 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract
37 Documents.
- 38 D. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of
39 floor finishing and promptly report test results to Architect.

40 **3.16 PROTECTION**

- 41 A. Protect concrete surfaces as follows:
42 1. Protect from petroleum stains.
43 2. Diaper hydraulic equipment used over concrete surfaces.
44 3. Prohibit vehicles from interior concrete slabs.
45 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
46 5. Prohibit placement of steel items on concrete surfaces.
47 6. Prohibit use of acids or acidic detergents over concrete surfaces.
48 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use
49 protective methods and materials, including temporary covering, recommended in writing by liquid floor
50 treatments installer.
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1

END OF SECTION

**SECTION 03 35 00
CONCRETE FINISHING**

PART 1 – GENERAL

1.1. SUMMARY

- A. Section Includes:
 - 1. Single application cure-densifier-hardener for concrete floors.
- B. Related Section:
 - 1. 03 3000 Cast-In-Place Concrete.

1.2. SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Section 01 3300 – Submittal Procedures.
- B. Product Data: Submit product data, including manufacturer’s Spec-Data® sheet, installation instructions and technical bulletins for specified products.
- C. Certificates: Manufacturer’s certification that the installer is acceptable.
- D. Maintenance Data: Maintenance instructions, including precautions for avoiding staining after application.

1.3. QUALITY ASSURANCE

- A. Installer Qualifications: Acceptable to the manufacturer.

1.4. DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Division 01 Product Requirements section.
- B. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.
- C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
- D. Handling: Protect materials from dirt, corrosion, oil, grease and other contaminants.

PART 2 – PRODUCTS

2.1. CONCRETE DENSIFIER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Ashford Formula or comparable products by one of the following:
 - 1. Prosoco, Consoliddeck.
 - 2. Or approved equal.
- B. Material: Penetrating silicate treatment that hardens, densifies, and dustproofs concrete flatwork.

PART 3 – EXECUTION

3.1. MANUFACTURER’S INSTRUCTIONS

- A. Compliance: Comply with manufacturer’s product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2. EXAMINATION

- A. Do not begin installation until substrates have been properly prepared and are suitable for application of product.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.3. 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.
- C. Do not use frozen material. Thaw and agitate prior to use.
- D. If construction equipment must be used for application, diaper all components that might drip oil,

1 hydraulic fluid or other liquids.

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3.4. INSTALLATION

- A. New Concrete: Apply cure-densifier hardener to new concrete as soon as the concrete is firm enough to work on after troweling; with colored concrete, wait a minimum of 30 days before application.
1. After final finishing, soft cut control joints. Clean concrete of any dirt, residue or soft cut saw debris. Allow surface to dry.
 2. Using a low pressure sprayer at 0.5 gpm, apply a single coat sufficient to wet the surface without producing puddles.
 3. Use a clean, microfiber pad to spread the product evenly and ensure uniform wetting. Avoid spreading once drying begins. Scrubbing is not necessary. If surfaces dry immediately, increase the rate of application. Surface should remain wet for 5 to 10 minutes. Adjust rate of application to eliminate puddles.
 4. Allow treated surfaces to dry.
 5. Immediately apply the specified curing compound or initiate the specified curing procedure.
 6. When the curing process is complete, use an automatic floor scrubber equipped with cleaning pads or brushes appropriate for removal of accumulated construction soiling and surface residues. Avoid pads or brushes which may damage the finished floor.

3.5. PROTECTION

- A. Protect installed floors for at least 3 months until chemical reaction process is complete.
1. Do not allow traffic on floors for 3 hours after application.
 2. Do not allow parking of vehicles on concrete slab.
 3. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
 4. Do not allow pipe cutting using pipe cutting machinery on concrete slab.
 5. Do not allow temporary placement and storage of steel members on concrete slabs.
 6. Clean up spills immediately and spot-treat stains with degreaser or oil emulsifier.
 7. Clean floor regularly in accordance with manufacturer's recommendations.

END OF SECTION

**SECTION 04 20 00
UNIT MASONRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Face Brick
 - 2. Mortar and grout.
 - 3. Reinforcing steel.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors.
 - 6. Embedded flashing.
 - 7. Miscellaneous masonry accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for each type and color of exposed masonry units and colored mortars.
- C. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.
 - 1. For masonry units include material test reports substantiating compliance with requirements.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
- E. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Environmental Product Declarations: For each product.

1.3 QUALITY ASSURANCE

- A. Standards: Comply with recommendations of Brick Institute of America (BIA), National Concrete Masonry Assoc. (NCMA), American Concrete Institute (ACI) and International Building Code (Wisconsin Enrolled Edition).
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- C. First-in-Place Mockup: Provide 25 sf of material mockup in place. Include as many corner, head, jamb, and sill conditions as reasonably possible.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 BRICK

- A. Manufacturer: Subject to compliance with requirements, provide Ironspot Smooth Modular brick by Ravenswood, or comparable product by one of the following:
 - 1. Cloud Ceramics – Midnight Modular Smooth.
 - 2. County Materials.
 - 3. Or approved equal.
- B. General: Provide shapes indicated and as follows:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

- 1 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
- 2
- 3 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
- 4
- 5 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- 6
- 7 C. Face Brick: ASTM C 216, Grade SW.
- 8 1. Unit Compressive Strength: Provides units with minimum average net-area compressive strength of 3000 psi.
- 9 2. Initial Rate of Absorption: Less than 30g/30 sq. in. per minute when tested per ASTM C67.
- 10 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
- 11 4. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
- 12
- 13
- 14 5. Size: Modular.
- 15 6. Product: As indicated on Drawings or Preapproved Equal.
- 16

17 **2.2 MORTAR AND GROUT MATERIALS**

- 18 A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- 19 B. Hydrated Lime: ASTM C 207, Type S.
- 20 C. Mortar Pigments: Iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- 21 1. Available Products:
- 22 a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
- 23 b. Davis Colors; True Tone Mortar Colors.
- 24 c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- 25 d. Or approved equal.
- 26
- 27 D. Aggregate for Mortar: ASTM C 144.
- 28 E. Aggregate for Grout: ASTM C 404.
- 29 F. Water: Potable.
- 30

31 **2.3 REINFORCEMENT**

- 32 A. Masonry Joint Reinforcement: ASTM A 951; hot-dip galvanized, carbon-steel wire.
- 33 1. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
- 34 2. Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- 35 3. Multi-Wythe Masonry:
- 36 a. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.
- 37
- 38 4. Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.
- 39
- 40

41 **2.4 TIES AND ANCHORS**

- 42 A. Materials:
- 43 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
- 44 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
- 45 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- 46
- 47 B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- 48
- 49
- 50 C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
- 51 1. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
- 52
- 53 D. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
- 54 1. Anchor Section for Welding to Steel Frame: Crimped ¼-inch- diameter, hot-dip galvanized steel wire.
- 55 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.
- 56
- 57

- 1 3. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie
- 2 section; formed from 0.053-inch- thick, steel sheet, galvanized after fabrication.
- 3 E. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate
- 4 and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-
- 5 dip galvanized after fabrication.
- 6 F. Adjustable Masonry-Veneer Anchors
- 7 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces
- 8 perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:
- 9 a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and
- 10 compression without deforming or developing play in excess of 0.05 inch.
- 11 2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
- 12 a. Anchor Section: Rib-stiffened, steel reinforced plastic coated wing with slotted holes for inserting
- 13 wire tie.
- 14 b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch- diameter,
- 15 carbon steel, ASTM A1064/A1064M with zinc coating, hot-dip galvanized after fabrication, ASTM
- 16 A153/A153M-B.
- 17 c. Products: Subject to compliance with requirements, provide Thermal 2-Seal Wing Nut Anchor
- 18 (Adjustable) by Hohman & Barnard, Inc or a comparable product by one of the following:
- 19 1) Heckmann Building Products Inc.; Pos-I-Tie ThermalClip System (75-TC).
- 20 2) Prosoco.; Thermal-Grip MVA.
- 21 3) Or approved equal.
- 22

23 2.5 EMBEDDED FLASHING MATERIALS

- 24 A. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
- 25 1. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene
- 26 interpolymer alloy 0.025 inch thick, with a 0.015-inch- thick coating of rubberized-asphalt adhesive.
- 27 a. Available Products:
- 28 1) Firestone "Flashguard."Hyload, Inc.
- 29 2) W.R. Grace "Perma-Barrier" or "MiraDRI."
- 30 3) Or approved equal.
- 31 B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."
- 32 C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products
- 33 recommended by flashing manufacturer.
- 34

35 2.6 MISCELLANEOUS MASONRY ACCESSORIES

- 36 A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent;
- 37 formulated from neoprene.
- 38 B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- 39 C. Weep/Vent Products: Use the following, unless otherwise indicated:
- 40 1. Hohmann & Barnard, Inc.; #343W - Wilko Weep Hole.
- 41 2. Or approved equal.
- 42 3. Color approved by Architect to match that of mortar.
- 43 D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
- 44 1. Provide one of the following configurations:
- 45 a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent
- 46 mesh from being clogged with mortar droppings.
- 47 b. Strips, not less than 2 inches thick and 10 inches wide, with dimpled surface designed to catch mortar
- 48 droppings and prevent weep holes from being clogged with mortar.
- 49 c. Sheets or strips full depth of cavity and installed to full height of cavity.
- 50 d. Sheets or strips not less than 2 inch thick and installed to full height of cavity with additional strips 4
- 51 inches high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from
- 52 being clogged with mortar.
- 53 2. Products:
- 54 a. Mortar Net USA, Ltd.; Mortar Net.
- 55 b. Or approved equal.
- 56

1 **2.7 MORTAR AND GROUT MIXES**

- 2 A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent
3 agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
4 1. Do not use calcium chloride in mortar or grout.
5 2. Limit cementitious materials in mortar to portland cement and lime.
6 B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar
7 for applications stated unless another type is indicated.
8 1. For masonry below grade or in contact with earth, use Type M.
9 2. For reinforced masonry, use Type S.
10 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing
11 walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated,
12 use Type N.
13 C. Grout for Unit Masonry: Comply with ASTM C 476.
14 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with
15 Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
16 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
17
18 D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to
19 produce color required. Do not add pigments to colored cement products.
20
21 1. Pigments shall not exceed 5 percent of mortar cement by weight.
22 2. Color to match existing mortar.
23

24 **PART 3 - EXECUTION**

25
26 **3.1 INSTALLATION, GENERAL**

- 27 A. Use full-size units without cutting if possible. If cutting is required, cut units with motor-driven saws; provide clean,
28 sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut
29 surfaces and, where possible, cut edges concealed.
30 B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
31 C. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
32 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints,
33 do not vary from plumb by more than 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum.
34 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more
35 than 1/8 inch in 10 feet, ¼ inch in 20 feet, or ½ inch maximum.
36

37 **3.2 LAYING MASONRY WALLS**

- 38 A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate
39 location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at
40 corners, jambs, and, where possible, at other locations.
41 B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use
42 units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Match pattern of existing brick.
43 C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with
44 masonry around built-in items.
45 D. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
46 E. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar
47 items, unless otherwise indicated.
48

49 **3.3 MORTAR BEDDING AND JOINTING**

- 50 A. Lay hollow and concrete masonry units as follows:
51 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
52 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
53 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
54 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells
55 are not grouted.
56 B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head
57 joints and shove into place. Do not deeply furrow bed joints or slush head joints.

- 1 C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless
- 2 otherwise indicated.
- 3 D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless
- 4 otherwise indicated.
- 5

6 **3.4 COMPOSITE MASONRY**

- 7 A. Bond wythes of composite masonry together using one of the following methods:
 - 8 a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - 9 b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with
 - 10 continuous horizontal wire in facing wythe attached to ties.
- 11 B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into
- 12 place.
- 13 C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls
- 14 together as follows:
 - 15 1. Provide individual metal ties not more than 16 inches o.c.
 - 16 2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
 - 17 3. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in
 - 18 mortar-filled cores.
- 19

20 **3.5 MASONRY JOINT REINFORCEMENT**

- 21 A. General: Install in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap
- 22 reinforcement a minimum of 6 inches.
- 23 B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- 24 C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- 25 D. Provide continuity at corners by using prefabricated L-shaped units.

26 **3.6 ANCHORING MASONRY TO STRUCTURAL MEMBERS**

- 27 A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the
- 28 following:
 - 29 1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless
 - 30 otherwise indicated.
 - 31 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
 - 32 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.
- 33

34 **3.7 ANCHORING MASONRY VENEERS**

- 35 A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
 - 36 1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use
 - 37 two fasteners.
 - 38 2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space
 - 39 between back of masonry veneer and face of sheathing.
 - 40 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - 41 4. Space anchors as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally with
 - 42 not less than 1 anchor for each 3.5 sq. ft. of wall area. Install additional anchors within 12 inches of openings
 - 43 and at intervals, not exceeding 36 inches, around perimeter.
- 44

45 **3.8 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS**

- 46 A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to
- 47 downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to
- 48 upward flow of air in cavities, and where indicated.
- 49 B. Install flashing as follows, unless otherwise indicated:
 - 50 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where
 - 51 flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar.
 - 52 Before covering with mortar, seal penetrations in flashing as recommended by flashing manufacturer.
 - 53 2. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and
 - 54 sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 - 55 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back
 - 56 from outside face of wall and adhere flexible flashing to top of metal drip edge.
 - 57 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2
 - 58 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

- 1 C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing
- 2 and as follows:
- 3 1. Use specified weep/vent products to form weep holes.
- 4 2. Space weep holes 24 inches o.c., unless otherwise indicated.
- 5 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
- 6 D. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in
- 7 Part 2 "Miscellaneous Masonry Accessories" Article.
- 8 E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
- 9 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing
- 10 and weep holes above horizontal blocking.

11
12 **3.9 CLEANING**

- 13 A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears
- 14 before tooling joints.
- 15 B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
- 16 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
- 17 2. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

18
19 **3.10 MASONRY WASTE DISPOSAL**

- 20 A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste
- 21 mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
- 22 1. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- 23 2. Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry
- 24 waste, and legally dispose of off Owner's property.

25
26 **3.11 REINFORCED UNIT MASONRY INSTALLATION**

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

39
40 **END OF SECTION**

**SECTION 04 22 00
CONCRETE UNIT MASONRY**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units (CMU's).
 - 2. Glazed concrete masonry units.
 - 3. Steel reinforcing bars.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
- C. Samples: For each type and color of exposed masonry unit and colored mortar.
- D. Sustainable Design Submittals:
 - 1. Environmental Product Declaration (EPD): For each product.
 - 2. Third-Party Certified Life Cycle Assessment: For each product.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product indicated. For masonry units include data on material properties and material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).

- 1 2. Density Classification: Normal weight unless otherwise indicated.
- 2 C. Glazed Concrete Masonry Units:
- 3 1. Glazed Surface: Smooth satin finish, externally heat-polymerized cast-on facing conforming to ASTM C744.
- 4 2. Products: Subject to compliance with requirements, provide one of the following:
- 5 a. Trenwyth, Astra-Glaze-SW+.
- 6 b. Westbrook Concrete Block, SpectraGlaze.
- 7 c. Or approved equal.
- 8

9 **2.3 MASONRY LINTELS**

- 10 A. General: Provide one of the following:
- 11 B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout.
- 12
- 13

14 **2.4 MORTAR AND GROUT MATERIALS**

- 15 A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- 16
- 17 B. Hydrated Lime: ASTM C 207, Type S.
- 18 C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- 19 D. Masonry Cement: ASTM C 91.
 - 20 1. Products: Subject to compliance with requirements, provide one of the following:
 - 21 a. Capital Materials Corporation;
 - 22 b. Cemex S.A.B. de C.V.
 - 23 c. Essroc, Italcementi Group;
 - 24 d. Lafarge North America Inc.; Lehigh Cement Company;
 - 25 e. National Cement Company, Inc.
- 26 E. Mortar Cement: ASTM C 1329.
 - 27 1. Products: Subject to compliance with requirements, provide one of the following
 - 28 a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.
- 29 F. Aggregate for Mortar: ASTM C 144.
 - 30 1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 31
 - 32 2. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 33 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
 - 34
- 35 G. Aggregate for Grout: ASTM C 404.
- 36 H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 37
 - 38 1. Products: Subject to compliance with requirements, provide one of the following:
 - 39 a. Euclid Chemical Company (The); Accelguard 80.
 - 40 b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - 41 c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- 42 I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
 - 43
 - 44 1. Products: Subject to compliance with requirements, provide one of the following:
 - 45 a. ACM Chemistries, Inc.; RainBloc for Mortar.
 - 46 b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - 47 c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- 48 J. Water: Potable.
- 49

50 **2.5 REINFORCEMENT**

- 51 A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- 52 B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 53 1. Interior Walls: Carbon steel.
 - 54 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 55 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
 - 56 4. Wire Size for Cross Rods: 0.187-inch (4.76-mm) diameter.
 - 57 5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.
 - 58 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.

7. Provide in lengths of not less than 10 feet (3 m) with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- (1.52-mm-) thick, steel sheet, galvanized after fabrication.
 - 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
 - 3. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.075-inch- (1.90-mm-) thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch (25 mm) of masonry face.
- D. Partition Top anchors: 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- F. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene, urethane, or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.8 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 mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime mortar.
 - 4. For reinforced masonry, use portland cement-lime mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type S.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S.

- 1 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-
- 2 bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not
- 3 indicated, use Type N.
- 4 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- 5 D. Grout for Unit Masonry: Comply with ASTM C 476.
- 6 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with
- 7 Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
- 8 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive
- 9 strength indicated, but not less than 2000 psi (14 MPa).
- 10 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

11
12
13 **PART 3 - EXECUTION**

14
15 **3.1 TOLERANCES**

16 A. Dimensions and Locations of Elements:

- 17 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4
- 18 inch (6 mm).
- 19 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
- 20 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6
- 21 mm) in a story height or 1/2 inch (12 mm) total.

22 B. Lines and Levels:

- 23 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm
- 24 in 3 m), or 1/2 inch (12 mm) maximum.
- 25 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more
- 26 than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
- 27 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8
- 28 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
- 29 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints,
- 30 do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or
- 31 1/2 inch (12 mm) maximum.
- 32 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in
- 33 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.

34 C. Joints:

- 35 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a
- 36 maximum thickness limited to 1/2 inch (12 mm).
- 37 2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus
- 38 1/4 inch (6 mm).
- 39 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

40
41 **3.2 LAYING MASONRY WALLS**

- 42 A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate
- 43 location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at
- 44 corners, jambs, and, where possible, at other locations.
- 45 B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining
- 46 construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before
- 47 laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- 48 C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use
- 49 units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- 50 D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with
- 51 masonry around built-in items.
- 52 E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- 53 F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or
- 54 plastic mesh in the joint below and rod mortar or grout into core.
- 55 G. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items
- 56 unless otherwise indicated.

- 1 **3.3 MORTAR BEDDING AND JOINTING**
- 2 A. Lay hollow CMUs as follows:
- 3 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
- 4 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
- 5 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
- 6 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells
- 7 are not grouted.
- 8 B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head
- 9 joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- 10 C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless
- 11 otherwise indicated.
- 12 D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise
- 13 indicated.
- 14
- 15 **3.4 MASONRY JOINT REINFORCEMENT**
- 16 A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior
- 17 side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
- 18 1. Space reinforcement not more than 16 inches (406 mm) o.c.
- 19 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
- 20 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12
- 21 inches (305 mm) beyond openings in addition to continuous reinforcement.
- 22 B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- 23 C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- 24 D. Provide continuity at corners by using prefabricated L-shaped units.
- 25 **3.5 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE**
- 26 A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply
- 27 with the following:
- 28 1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete
- 29 unless otherwise indicated. Keep open space free of mortar and other rigid materials.
- 30 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
- 31 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c.
- 32 horizontally.
- 33
- 34 **3.6 FLASHING**
- 35 A. General: Install embedded flashing in masonry at lintels, ledges, other obstructions to downward flow of water in
- 36 wall, and where indicated.
- 37 B. Install flashing as follows unless otherwise indicated:
- 38 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where
- 39 flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar.
- 40 Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended
- 41 by flashing manufacturer.
- 42 2. At lintels, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills,
- 43 extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
- 44 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13
- 45 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.
- 46 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2
- 47 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- 48 C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's
- 49 written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above
- 50 and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU
- 51 cell pans at CMU webs and extend from face shell to face shell.
- 52
- 53 **3.7 REINFORCED UNIT MASONRY INSTALLATION**
- 54 A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry
- 55 elements during construction.
- 56 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms
- 57 sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position
- 58 and shape during construction and curing of reinforced masonry.

- 1 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their
- 2 own weight and other loads that may be placed on them during construction.
- 3 B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- 4 C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout
- 5 pressure.
- 6 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including
- 7 minimum grout space and maximum pour height.
- 8 2. Limit height of vertical grout pours as indicated within drawings.
- 9

10 **3.8 FIELD QUALITY CONTROL**

- 11 A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports.
- 12 Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of
- 13 materials that fail to meet specified requirements shall be done at Contractor's expense.
- 14 B. Inspections: Level 1 special inspections according to the "International Building Code."
- 15 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- 16 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations
- 17 of reinforcement.
- 18 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- 19 C. Testing Prior to Construction: One set of tests.
- 20 D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- 21 E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- 22 F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- 23 G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air
- 24 content and compressive strength.
- 25 H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- 26

27 **3.9 PARGING**

- 28 A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4
- 29 inch (19 mm).
- 30 B. Use a steel-trowel finish to produce a smooth, flat, dense surface. Form a wash at top of parging and a cove at bottom.
- 31 C. Damp-cure parging for at least 24 hours and protect parging until cured.
- 32

33 **3.10 REPAIRING, POINTING, AND CLEANING**

- 34 A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before
- 35 tooling joints.
- 36 B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
- 37 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
- 38 2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on
- 39 exposed surfaces.
- 40

41 **3.11 MASONRY WASTE DISPOSAL**

- 42 A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste
- 43 mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
- 44 1. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.
- 45 B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and
- 46 other masonry waste, and legally dispose of off Owner's property.
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END OF SECTION

**SECTION 04 72 00
CAST STONE MASONRY**

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cast stone trim units.
- B. Mortar Materials.
- C. Reinforcing accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- C. Mortar Color Selection Samples.
- D. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. A firm with a minimum of 5 years' experience producing cast stone of types required for project.
 - 2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- C. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- D. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Rock Ridge Cast Stone, LLC, or comparable products by one of the following:
 - 1. American Artstone.
 - 2. Arriscraft.
 - 3. Sun Precast Company, Inc.
 - 4. Or approved equal.

2.2 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.
 - 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - 3. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet (6 meters).
 - 4. Color: Selected by Architect from manufacturer's full range.
 - 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.

- 1 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch (3 mm)
- 2 or length divided by 360, whichever is greater, but not more than 1/4 inch (6 mm).
- 3 2. Unless otherwise indicated on drawings, provide:
- 4 a. Wash or slope of 1:12 on exterior horizontal surfaces.
- 5 b. Drips on projecting components, wherever possible.
- 6 c. Raised fillets at back of sills and at ends to be built in.
- 7 C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI
- 8 318.

9 2.3 MATERIALS

- 10 A. Portland Cement: ASTM C150/C150M.
- 11 1. For Mortar: Type I or II, except Type III may be used in cold weather.
- 12 B. Hydrated Lime: ASTM C207, Type S.
- 13 C. Portland Cement-Lime Mix: Package blend of portland cement and hydrated lime containing no other ingredients.
- 14 D. Aggregate for Mortar: ASTM C144.
- 15 1. For mortar exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- 16 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- 17 3. White-Mortar Aggregate: Natural white sand or crushed white stone.
- 18 E. Admixtures: ASTM C494/C494M.
- 19 F. Water: Potable.
- 20 G. Reinforcing Bars: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed bars, galvanized.
- 21 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- 22 2. Epoxy coated in accordance with ASTM A775/A775M.
- 23 H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- 24 I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- 25 J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other
- 26 construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for
- 27 intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry
- 28 materials.

29 2.4 MORTAR MIXES

- 30 A. Comply with requirements of Section 04 2000 for mortar mixes.

31 PART 3 EXECUTION

32 3.1 INSTALLATION

- 33 A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.
- 34 B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- 35 C. Setting:
- 36 1. Drench cast stone components with clear, running water immediately before installation.
- 37 2. Set units in a full bed of mortar unless otherwise indicated.
- 38 3. Fill vertical joints with mortar.
- 39 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

40 3.2 TOLERANCES

- 41 A. Joints: Make all joints 3/8 inch (9.5 mm), except as otherwise detailed.
- 42 1. Rake mortar joints 3/4 inch (19 mm) for pointing.
- 43 2. Remove excess mortar from face of stone before pointing joints.
- 44 3. Point joints with mortar in layers 3/8 inch (9.5 mm) thick and tool to a slight concave profile.
- 45 4. Leave the following joints open for sealant:
- 46 a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
- 47 b. Joints in projecting units.
- 48 c. Joints between rigidly anchored units, including soffits, panels, and column covers.
- 49 d. Joints below lugged sills and stair treads.
- 50 e. Joints below ledge and relieving angles.
- 51 f. Joints labeled "expansion joint".

- 1 **3.3 CLEANING**
- 2 A. Keep cast stone components clean as work progresses.
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END OF SECTION

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**SECTION 05 12 00
STRUCTURAL STEEL FRAMING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Structural-steel materials.
- 7 2. Shrinkage-resistant grout.
- 8 B. Related Requirements:
- 9 1. Section 05 31 00 "Steel Decking" for field installation of shear stud connectors through deck.
- 10 2. Section 05 50 00 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame
- 11 and other steel items not defined as structural steel.
- 12 3. Section Section 09 91 23 "Interior Painting" and Section 09 96 00 "High Performance Coatings" for painting
- 13 requirements.

14 **1.2 DEFINITIONS**

- 15 A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

16 **1.3 COORDINATION**

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

22 **1.4 PREINSTALLATION MEETINGS**

- 23 A. Preinstallation Conference: Conduct conference at Project site.

24 **1.5 ACTION SUBMITTALS**

- 25 A. Product Data:
- 26 1. Structural-steel materials.
- 27 2. High-strength, bolt-nut-washer assemblies.
- 28 3. Anchor rods.
- 29 4. Threaded rods.
- 30 5. Shop primer.
- 31 6. Galvanized-steel primer.
- 32 7. Galvanized repair paint.
- 33 8. Shrinkage-resistant grout.
- 34 B. Shop Drawings: Show fabrication of structural-steel components.
- 35 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
- 36 2. Include embedment Drawings.
- 37 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size,
- 38 length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds
- 39 where backing bars are to remain.
- 40 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned
- 41 and slip-critical, high-strength bolted connections.
- 42 5. Identify members not to be shop primed.
- 43 C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with
- 44 AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

- 1 1. Power source (constant current or constant voltage).
- 2 2. Electrode manufacturer and trade name, for demand-critical welds.

3 **1.6 INFORMATIONAL SUBMITTALS**

- 4 A. Welding certificates.
- 5 B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop
- 6 primers are compatible with topcoats.
- 7 C. Mill test reports for structural-steel materials, including chemical and physical properties.
- 8 D. Product Test Reports: For the following:
 - 9 1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 10 2. Direct-tension indicators.
 - 11 3. Tension-control, high-strength, bolt-nut-washer assemblies.

12 **1.7 QUALITY ASSURANCE**

- 13 A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
 - 14 1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the
 - 15 supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be
 - 16 considered separate processes for welding personnel qualification.

17 **1.8 DELIVERY, STORAGE, AND HANDLING**

- 18 A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced
- 19 by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from
- 20 corrosion and deterioration.
 - 21 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to
 - 22 members or supporting structures. Repair or replace damaged materials or structures as directed.
- 23 B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 24 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and
 - 25 seals containers.
 - 26 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 27 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M,
 - 28 Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

29 **PART 2 - PRODUCTS**

30 **2.1 STRUCTURAL-STEEL MATERIALS**

- 31 A. W-Shapes: ASTM A992/A992M.
- 32 B. Channels, Angles, M-Shapes: ASTM A36/A36M.
- 33 C. Plate and Bar: ASTM A36/A36M.
- 34 D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
- 35 E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - 36 1. Weight Class: Standard.
 - 37 2. Finish: Black except where indicated to be galvanized.
- 38 F. Welding Electrodes: Comply with AWS requirements.

39 **2.2 BOLTS AND CONNECTORS**

- 40 A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 , Type 1, heavy-hex steel
- 41 structural bolts; ASTM A563, Grade DH , heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened
- 42 carbon-steel washers; all with plain finish.
 - 43 1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

1 **2.3 RODS**

- 2 A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
- 3 1. Configuration: Straight.
- 4 2. Nuts: ASTM A563 heavy-hex carbon steel.
- 5 3. Plate Washers: ASTM A36/A36M carbon steel.
- 6 4. Washers: ASTM F436 , Type 1, hardened carbon steel.
- 7 5. Finish: Plain.
- 8 B. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
- 9 1. Nuts: ASTM A563 heavy-hex carbon steel.
- 10 2. Plate Washers: ASTM A36/A36M carbon steel.
- 11 3. Washers: ASTM F436, Type 1, hardened carbon steel.
- 12 4. Finish: Plain.

13 **2.4 PRIMER**

- 14 A. Steel Primer:
- 15 1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- 16 2. SSPC-Paint 23, latex primer.
- 17 3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- 18 B. Galvanized-Steel Primer: MPI#26.
- 19 1. Etching Cleaner: MPI#25, for galvanized steel.
- 20 2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- 21

22 **2.5 SHRINKAGE-RESISTANT GROUT**

- 23 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.
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26 **2.6 FABRICATION**

- 27 A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
- 28 1. Camber structural-steel members where indicated.
- 29 2. Fabricate beams with rolling camber up.
- 30 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
- 31 4. Mark and match-mark materials for field assembly.
- 32 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- 33 B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
- 34 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- 35 C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- 36 D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- 37 E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.
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40 **2.7 SHOP CONNECTIONS**

- 41 A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
- 42 1. Joint Type: Snug tightened.
- 43 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.
- 44 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.
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- 1 **2.8 GALVANIZING**
- 2 A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with
- 3 ASTM A123/A123M.
- 4 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by
- 5 plugging with zinc solder and filing off smooth.
- 6 2. Galvanize lintels attached to structural-steel frame and located in exterior walls.

- 7 **2.9 SHOP PRIMING**
- 8 A. Shop prime steel surfaces, except the following:
- 9 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2
- 10 inches.
- 11 2. Surfaces to be field welded.
- 12 3. Surfaces of high-strength bolted, slip-critical connections.
- 13 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
- 14 5. Galvanized surfaces unless indicated to be painted.
- 15 6. Corrosion-resisting (weathering) steel surfaces.
- 16 7. Surfaces enclosed in interior construction.
- 17 B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux
- 18 deposits. Prepare surfaces in accordance with the following specifications and standards:
- 19 1. SSPC-SP 2.
- 20 2. SSPC-SP 3.
- 21 3. SSPC-SP 11.
- 22 C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning
- 23 steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner .
- 24 D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written
- 25 instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming
- 26 methods that result in full coverage of joints, corners, edges, and exposed surfaces.
- 27 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- 28 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of
- 29 second coat to distinguish it from first.

30 **PART 3 - EXECUTION**

- 31 **3.1 EXAMINATION**
- 32 A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of
- 33 anchor rods, bearing plates, and other embedments for compliance with requirements.
- 34 B. Proceed with installation only after unsatisfactory conditions have been corrected.

- 35 **3.2 PREPARATION**
- 36 A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb,
- 37 and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove
- 38 temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise
- 39 indicated on Drawings.

- 40 **3.3 ERECTION**
- 41 A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and
- 42 ANSI/AISC 360.
- 43 B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing
- 44 materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
- 45 1. Set plates for structural members on wedges, shims, or setting nuts as required.
- 46 2. Weld plate washers to top of baseplate.
- 47 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove
- 48 wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

- 1 4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain.
- 2 Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written
- 3 installation instructions for grouting.
- 4 C. Maintain erection tolerances of structural steel within ANSI/AISC 303.
- 5 D. Align and adjust various members that form part of complete frame or structure before permanently fastening.
- 6 Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform
- 7 necessary adjustments to compensate for discrepancies in elevations and alignment.
- 8 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on
- 9 Drawings.
- 10 E. Splice members only where indicated.
- 11 F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within
- 12 smoothness limits in AWS D1.1/D1.1M.
- 13 G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit
- 14 bolts.

15 3.4 FIELD CONNECTIONS

- 16 A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using
- 17 High-Strength Bolts" for bolt and joint type specified.
- 18 1. Joint Type: Snug tightened.
- 19 B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications,
- 20 weld quality, and methods used in correcting welding work.
- 21 1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections,
- 22 and removal of paint on surfaces adjacent to field welds.
- 23 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
- 24 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding
- 25 tolerances in ANSI/AISC 303 for mill material.

26 3.5 INSTALLATION OF PREFABRICATED BUILDING COLUMNS

- 27 A. Install prefabricated building columns to comply with ANSI/AISC 360, manufacturer's written recommendations,
- 28 and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

29 3.6 REPAIR

- 30 A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with
- 31 ASTM A780/A780M.
- 32 B. Touchup Painting:
- 33 1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the
- 34 same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- 35 a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- 36 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting."
- 37 3. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance
- 38 Coatings."

39 3.7 FIELD QUALITY CONTROL

- 40 A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
- 41 1. Verify structural-steel materials and inspect steel frame joint details.
- 42 2. Verify weld materials and inspect welds.
- 43 3. Verify connection materials and inspect high-strength bolted connections.
- 44 B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- 45 1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for
- 46 Structural Joints Using High-Strength Bolts."
- 47 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
- 48 a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M
- 49 and the following inspection procedures, at testing agency's option:
- 50 1) Liquid Penetrant Inspection: ASTM E165/E165M.

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- 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.
- b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

7 **END OF SECTION**

SECTION 05 31 00
STEEL DECKING

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3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Roof deck.
- 7 2. Noncomposite form deck.
- 8 B. Related Requirements:
- 9 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over
- 10 steel deck.
- 11 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
- 12 3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

13 **1.2 ACTION SUBMITTALS**

- 14 A. Product Data:
- 15 1. Roof deck.
- 16 2. Noncomposite form deck.
- 17 B. Shop Drawings:
- 18 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings,
- 19 special jointing, accessories, and attachments to other construction.

20 **1.3 INFORMATIONAL SUBMITTALS**

- 21 A. Welding certificates.
- 22 B. Product Certificates: For each type of steel deck.
- 23 C. Test and Evaluation Reports:
- 24 1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the
- 25 following complies with requirements:
- 26 a. Power-actuated mechanical fasteners.
- 27 2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.
- 28 D. Qualification Statements: For welding personnel.

29 **1.4 QUALITY ASSURANCE**

- 30 A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding
- 31 codes:
- 32 1. AWS D1.1/D1.1M.
- 33 2. AWS D1.3/D1.3M.
- 34 B. FM Approvals' RoofNav Listing: Provide steel roof deck evaluated by FM Approvals and listed in its "RoofNav" for
- 35 Class 1 fire rating and Class 1-60 windstorm ratings. Identify materials with FM Approvals Certification markings.

36 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 37 A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- 38 B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide
- 39 drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1 **PART 2 - PRODUCTS**

2 **2.1 ROOF DECK**

- 3 A. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with
4 the following:
- 5 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33G60 zinc coating.
 - 6 2. Deck Profile: As indicated.
 - 7 3. Profile Depth: As indicated.
 - 8 4. Design Uncoated-Steel Thickness: 0.0358 inch.
 - 9 5. Span Condition: Triple span or more.
 - 10 6. Side Laps: Overlapped or interlocking seam at Contractor's option.

11 **2.2 NONCOMPOSITE FORM DECK**

- 12 A. Fabrication of Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite deck panels used as a form to
13 comply with SDI NC, with the minimum section properties indicated, and with the following:
- 14 1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 15 2. Profile Depth: As Indicated
 - 16 3. Span Condition: Triple span or more.
 - 17 4. Side Laps: Overlapped or interlocking seam at Contractor's option.

18 **2.3 ACCESSORIES**

- 19 A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- 20 B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel
21 fasteners; or self-drilling, self-threading screws.
- 22 C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum
23 diameter.
- 24 D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- 25 E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than
26 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for
27 application.
- 28 F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck,
29 and of thickness and profile recommended by SDI standards for overhang and slab depth.
- 30 G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as
31 deck unless otherwise indicated.
- 32 H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.
- 33 I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-
34 inch minimum diameter.
- 35 J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut
36 holes in the field.
- 37 K. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-
38 wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- 39 L. Galvanizing Repair Paint: ASTM A780/A780M.
- 40 M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

41 **PART 3 - EXECUTION**

42 **3.1 EXAMINATION**

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

- 1 **3.2 INSTALLATION, GENERAL**
- 2 A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's
- 3 written instructions; and requirements in this Section.
- 4 B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- 5 C. Locate deck bundles to prevent overloading of supporting members.
- 6 D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on
- 7 supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- 8 E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- 9 F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to
- 10 deck.
- 11 G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and
- 12 support of other work.
- 13 H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of
- 14 welds, and methods used for correcting welding work.
- 15 I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install in
- 16 accordance with deck manufacturer's written instructions.

- 17 **3.3 INSTALLATION OF ROOF DECK**
- 18 A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated
- 19 or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
- 20 1. Weld Diameter: 5/8 inch, nominal.
- 21 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each
- 22 support. Space welds 18 inches apart, maximum.
- 23 3. Weld Washers: Install weld washers at each weld location.
- 24 B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at
- 25 intervals not exceeding the lesser of one-half of the span or 18 inches, and as follows:
- 26 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- 27 2. Mechanically clinch or button punch.
- 28 3. Fasten with a minimum of 1-1/2-inch- long welds.
- 29 C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints
- 30 as follows:
- 31 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.
- 32 D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to
- 33 top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
- 34 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- 35 E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing
- 36 channels in accordance with deck manufacturer's written instructions. Mechanically fasten to substrate to provide a
- 37 complete deck installation.
- 38 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

- 39 **3.4 INSTALLATION OF FLOOR DECK**
- 40 A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated
- 41 and as follows:
- 42 1. Weld Diameter: 5/8 inch, nominal.
- 43 2. Weld Spacing:
- 44 a. Weld edge ribs of panels at each support. Space additional welds an average of 16 inches apart, but
- 45 not more than 18 inches apart.
- 46 b. Space and locate welds as indicated.
- 47 3. Weld Washers: Install weld washers at each weld location.
- 48 B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at
- 49 intervals not exceeding the lesser of one-half of the span or 36 inches, and as follows:
- 50 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- 51 2. Mechanically clinch or button punch.
- 52 3. Fasten with a minimum of 1-1/2-inch- long welds.
- 53 C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints
- 54 as follows:

- 1 1. End Joints: Lapped or butted at Contractor's option.
- 2 D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance
- 3 with SDI recommendations unless otherwise indicated.
- 4 E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI
- 5 recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

6 **3.5 REPAIR**

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

9 **3.6 FIELD QUALITY CONTROL**

- 10 A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- 11 B. Tests and Inspections:
- 12 1. Steel decking will be considered defective if it does not pass tests and inspections.
- 13 C. Prepare test and inspection reports.

14 **END OF SECTION**

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2

**SECTION 05 40 00
COLD-FORMED METAL FRAMING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Exterior non-load-bearing wall framing.
 - 7 2. Interior non-load-bearing wall framing.
 - 8 3. Soffit framing.
- 9 B. Related Requirements:
- 10 1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections
11 used with cold-formed metal framing.
 - 12 2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-
13 framed, shaft-wall assemblies, with height limitations.
 - 14 3. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud
15 framing, with height limitations and ceiling-suspension assemblies.

16 **1.2 PREINSTALLATION MEETINGS**

- 17 A. Preinstallation Conference: Conduct conference at Project site.

18 **1.3 ACTION SUBMITTALS**

- 19 A. Product Data: For the following:
- 20 1. Cold-formed steel framing materials.
 - 21 2. Exterior non-load-bearing wall framing.
 - 22 3. Interior non-load-bearing wall framing.
 - 23 4. Vertical deflection clips.
 - 24 5. Single deflection track.
 - 25 6. Drift clips.
 - 26 7. Soffit framing.
 - 27 8. Post-installed anchors.
 - 28 9. Power-actuated anchors.
 - 29 10. Sill sealer gasket.
 - 30 11. Sill sealer gasket/termite barrier.
- 31 B. Shop Drawings:
- 32 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and
33 fastening and anchorage details, including mechanical fasteners.
 - 34 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices,
35 accessories, connection details, and attachment to adjoining work.
- 36 C. Delegated Design Submittal: For cold-formed steel framing.

37 **1.4 INFORMATIONAL SUBMITTALS**

- 38 A. Welding certificates.
- 39 B. Product Certificates: For each type of code-compliance certification for studs and tracks.
- 40 C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified
41 testing agency.
- 42 1. Steel sheet.
 - 43 2. Expansion anchors.
 - 44 3. Power-actuated anchors.
 - 45 4. Mechanical fasteners.
 - 46 5. Vertical deflection clips.

- 1 6. Horizontal drift deflection clips
- 2 7. Miscellaneous structural clips and accessories.
- 3 D. Research Reports:
- 4 1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-
- 5 ES or other qualified testing agency acceptable to authorities having jurisdiction.
- 6 2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

7 **1.5 QUALITY ASSURANCE**

- 8 A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.
- 9 B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with
- 10 calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield
- 11 strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- 12 C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified
- 13 according to the product-certification program of the Certified Steel Stud Association.
- 14 D. Welding Qualifications: Qualify procedures and personnel according to the following:
- 15 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 16 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- 17 E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family
- 18 Dwellings."

19 **1.6 DELIVERY, STORAGE, AND HANDLING**

- 20 A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage
- 21 during delivery, storage, and handling as required in AISI S202.

22 **PART 2 - PRODUCTS**

23 **2.1 MANUFACTURERS**

- 24 A. Manufacturers
- 25 1. ClarkDietrich
- 26 2. MarinoWARE
- 27 3. Nuconsteel, A Nucor Company

28 **2.2 PERFORMANCE REQUIREMENTS**

- 29 A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements,"
- 30 to design cold-formed steel framing.
- 31 B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and
- 32 under conditions indicated.
- 33 1. Design Loads: As indicated on Drawings.
- 34 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the
- 35 following:
- 36 a. Exterior Non-Load-Bearing Framing: Horizontal deflection of $1/360$ of the wall height.
- 37 b. Interior Non-Load-Bearing Framing: Horizontal deflection of $1/240$ of the wall height under a
- 38 horizontal load of 5 lbf/sq. ft..
- 39 3. Design framing systems to provide for movement of framing members located outside the insulated
- 40 building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on
- 41 fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature
- 42 change of 120 deg F.
- 43 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to
- 44 accommodate live load deflection of primary building structure as follows:
- 45 a. Upward and downward movement of 1 inch.
- 46 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for
- 47 contribution of sheathing materials.

- 1 C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with
- 2 AISI S100 and ASTM C955.
- 3 D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with
- 4 appropriate markings of applicable testing agency.
- 5 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified
- 6 testing agency acceptable to authorities having jurisdiction.

7 **2.3 COLD-FORMED STEEL FRAMING MATERIALS**

- 8 A. Framing Members, General: Comply with ASTM C955 for conditions indicated.
- 9 B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as
- 10 follows:
- 11 1. Grade: As required by structural performance.
- 12 2. Coating: G90 .
- 13 C. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as
- 14 follows:
- 15 1. Grade: As required by structural performance.
- 16 2. Coating: G60.

17 **2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING**

- 18 A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened
- 19 flanges, and as follows:
- 20 1. Minimum Base-Metal Thickness: 0.0329 inch.
- 21 2. Flange Width: 1-5/8 inches.
- 22 B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened
- 23 flanges, and as follows:
- 24 1. Minimum Base-Metal Thickness: Matching steel studs.
- 25 2. Flange Width: 1-1/4 inches.
- 26 C. Vertical Deflection Clips, Exterior: Manufacturer's standard head clips, capable of accommodating upward and
- 27 downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- 28 D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges,
- 29 of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal
- 30 loads and transfer them to the primary structure, and as follows:
- 31 1. Minimum Base-Metal Thickness: 0.0428 inch.
- 32 2. Flange Width: 1 inch plus the design gap for one-story structures.
- 33 E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward
- 34 vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and
- 35 structure.

36 **2.5 INTERIOR NON-LOAD-BEARING WALL FRAMING**

- 37 A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened
- 38 flanges, and as follows:
- 39 1. Minimum Base-Metal Thickness: 0.0329 inch
- 40 2. Flange Width: 1-5/8 inches.
- 41 B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened
- 42 flanges, and as follows:
- 43 1. Minimum Base-Metal Thickness: Matching steel studs.
- 44 2. Flange Width: 1-1/4 inches.
- 45 C. Vertical Deflection Clips, Interior: Manufacturer's standard head clips, capable of accommodating upward and
- 46 downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- 47 D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges,
- 48 of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal
- 49 loads and transfer them to the primary structure, and as follows:
- 50 1. Minimum Base-Metal Thickness: 0.0428 inch.
- 51 2. Flange Width: 1 inch plus the design gap for one-story structures.

- 1 E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward
2 vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and
3 structure.

4 **2.6 SOFFIT FRAMING**

- 5 A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened
6 flanges, and as follows:
7 1. Minimum Base-Metal Thickness: 0.0329 inch.
8 2. Flange Width: 1-5/8 inches (41 mm) minimum.

9 **2.7 FRAMING ACCESSORIES**

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

24 **2.8 ANCHORS, CLIPS, AND FASTENERS**

- 25 A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.
26 B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat,
27 hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.
28 C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless
29 otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation
30 report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
31 1. Uses: Securing cold-formed steel framing to structure.
32
33 2. Type: Torque-controlled expansion anchor.
34 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or
35 ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
36 D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load,
37 according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
38 E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
39 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
40 F. Welding Electrodes: Comply with AWS standards.

41 **2.9 MISCELLANEOUS MATERIALS**

- 42 A. Galvanizing Repair Paint: ASTM A780/A780M.
43 B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of
44 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
45 C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with
46 ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.
47 D. Shims: Load-bearing, high-density, multimer, nonleaching plastic; or cold-formed steel of same grade and
48 metallic coating as framing members supported by shims.
49 E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths
50 to match width of bottom track or rim track members as required.

- 1 **2.10 FABRICATION**
- 2 A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely
- 3 fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and
- 4 requirements in this Section.
- 5 1. Fabricate framing assemblies using jigs or templates.
- 6 2. Cut framing members by sawing or shearing; do not torch cut.
- 7 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin
- 8 fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
- 9 a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of
- 10 welds, and methods used in correcting welding work.
- 11 b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined
- 12 members by no fewer than three exposed screw threads.
- 13 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw
- 14 fastening, according to Shop Drawings.
- 15 B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift
- 16 fabricated assemblies by means that prevent damage or permanent distortion.
- 17 C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10
- 18 feet and as follows:
- 19 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location.
- 20 Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing
- 21 materials.
- 22 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of
- 23 1/8 inch.

24 **PART 3 - EXECUTION**

- 25 **3.1 EXAMINATION**
- 26 A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for
- 27 installation tolerances and other conditions affecting performance of the Work.
- 28 B. Proceed with installation only after unsatisfactory conditions have been corrected.

- 29 **3.2 PREPARATION**
- 30 A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to
- 31 structural members indicated to receive sprayed fire-resistive materials.
- 32 B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete
- 33 installation of cold-formed framing without reducing thickness of fire-resistive materials below that required to
- 34 obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.
- 35 C. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab
- 36 at stud or joist locations.

- 37 **3.3 INSTALLATION, GENERAL**
- 38 A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- 39 B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless
- 40 more stringent requirements are indicated.
- 41 C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
- 42 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line
- 43 joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16
- 44 inch.
- 45 D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely
- 46 fastened.
- 47 1. Cut framing members by sawing or shearing; do not torch cut.
- 48 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire
- 49 tying of framing members is not permitted.

- 1 a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of
- 2 welds, and methods used in correcting welding work.
- 3 b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for
- 4 spacing, edge distances, and screw penetration.
- 5 E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- 6 F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was
- 7 designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been
- 8 completed and permanent connections to framing are secured.
- 9 G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- 10 H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers,
- 11 sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- 12 I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard
- 13 punched openings.

3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

- 14 A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- 15 B. Fasten both flanges of studs to [top and] bottom track unless otherwise indicated. Space studs as follows:
- 16 1. Stud Spacing: As indicated on Drawings.
- 17 C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and
- 18 similar requirements.
- 19 D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing
- 20 lateral support.
- 21 1. Install single deep-leg deflection tracks and anchor to building structure.
- 22 2. Connect vertical deflection clips to infill studs and anchor to building structure.
- 23 3. Connect drift clips to cold-formed steel framing and anchor to building structure.
- 24 E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48
- 25 inches apart. Fasten at each stud intersection.
- 26 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- 27 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track
- 28 solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid
- 29 blocking to stud webs or flanges.
- 30 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- 31 F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection
- 32 track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs,
- 33 secured to stud webs or flanges.
- 34 1. Install solid blocking at 96-inch centers.
- 35 G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles,
- 36 anchors, and fasteners, to provide a complete and stable wall-framing system.
- 37

3.5 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

- 38 A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.
- 39 B. Fasten both flanges of studs to [top and] bottom track unless otherwise indicated. Space studs as follows:
- 40 1. Stud Spacing: 16 inches.
- 41 C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and
- 42 similar requirements.
- 43 D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing
- 44 lateral support.
- 45 1. Install single deep-leg deflection tracks and anchor to building structure.
- 46 2. Connect vertical deflection clips to studs and anchor to building structure.
- 47 3. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- 48 E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48
- 49 inches apart. Fasten at each stud intersection.
- 50 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- 51 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track
- 52 solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid
- 53 blocking to stud webs or flanges.
- 54

- 1 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
2 F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection
3 track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs,
4 secured to stud webs or flanges.
5 1. Install solid blocking at 96-inch.
6 G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles,
7 anchors, and fasteners, to provide a complete and stable wall-framing system.

8 **3.6 INSTALLATION TOLERANCES**

- 9 A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8
10 inch in 10 feet and as follows:
11 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative
12 error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

13 **3.7 REPAIR**

- 14 A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel
15 framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

16 **3.8 FIELD QUALITY CONTROL**

- 17 A. Testing: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and
18 prepare test reports.
19 B. Field and shop welds will be subject to testing and inspecting.
20 C. Testing agency will report test results promptly and in writing to Contractor and Architect.
21 D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
22 E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced
23 or additional work with specified requirements.

24 **3.9 PROTECTION**

- 25 A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure
26 that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

27 **END OF SECTION**

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**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Loose bearing and leveling plates, beam seats, and steel door frame supports.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Miscellaneous steel framing and supports.
4. Metal ladders.

1.2 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Paint products.
2. Grout.

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

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding certificates.

D. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.

B. Store material in a location and manner to avoid damage. Do not stack components. Lay out components on firm foundation material such that bending cannot occur.

C. Store metal components in a clean dry location, away from uncured concrete, cement, or masonry products, acids, oxidizers, rain water, or any other chemical or substance that might damage the material or finish.

D. Plan work and storage locations to keep on-site handling to a minimum.

E. Exercise particular care to avoid damage to material finishes or unprotected surfaces when handling.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 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 A 36/A 36M.
- D. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29 M, Grade 1010.
- E. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- F. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- G. Cast Iron: Either gray iron, ASTM C 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- I. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632 M, Alloy 6061-T6.
- J. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- K. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).
- L. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous casting, either ASTM A 47/A 47M malleable iron or ASTM A 27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.
- D. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- E. Anchor Bolts: ASTM F 1554, Grade 36.
- F. Eyebolts: ASTM A 489.
- G. Machine Screws: ASME B18.6.3.
- H. Lag Bolts: ASME B18.2.1.
- I. Wood Screws: Flat head, ASME B18.6.1.
- J. Plain Washers: Round, ASME B18.22.1.
- K. Lock Washers: Helical, spring type, ASME B18.21.1.
- L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

2.3 FABRICATION – ELEVATOR METAL FABRICATIONS

- A. Elevator Sump Covers:
 - 1. Welded or pressure-locked gratings with maximum 1/2 inch space between bearing bars.
 - 2. Covers for Supports: Steel angle frames with anchor for embedment in fastening to concrete; galvanized finish.

- 1 B. Sill Angles:
2 1. Finish: Galvanized.
3
- 4 **2.4 METAL LADDERS**
5 A. Elevator Pit Ladders: ASTM A17/CSA B44.
6 B. Manufacturers:
7 1. Alaco Ladder Company.
8 2. McMaster-Carr.
9 3. Platforms & Ladders.
10 4. Or approved equal.
11
- 12 **2.5 METAL SHIPS' LADDERS**
13 A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and
14 pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
15 B. Treads are not to be less than 4-inches exclusive of nosing or less than 8-1/2 inches including nosing, and riser height
16 not to be more than 9-1/2 inches.
17 C. Fabricate treads from abrasive-surface floor plate.
- 18 **2.6 MISCELLANEOUS MATERIALS**
19 A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with
20 MPI#79.
21 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59,
22 Subpart D (EPA Method 24).
23 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
24 B. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
25 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59,
26 Subpart D (EPA Method 24).
27 C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
28 D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints
29 specified to be used over it.
30 E. Non-shrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically
31 recommended by manufacturer for heavy-duty loading applications.
32 F. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with
33 ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
34 G. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for
35 normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless
36 otherwise indicated.
37
- 38 **2.7 FABRICATION, GENERAL**
39 A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for
40 shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units
41 for reassembly and coordinated installation.
42 B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32
43 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
44 C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
45 D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
46 E. Weld corners and seams continuously to comply with the following:
47 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base
48 metals.
49 2. Obtain fusion without undercut or overlap.
50 3. Remove welding flux immediately.
51 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after
52 finishing and contour of welded surface matches that of adjacent surface.
53 F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where
54 exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated.
55 Locate joints where least conspicuous.
56 G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep
57 holes where water may accumulate.

- 1 H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- 2 I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure
- 3 metal fabrications rigidly in place and to support indicated loads.
- 4 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel
- 5 strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches
- 6 from ends and corners of units and 24 inches o.c., unless otherwise indicated.
- 7

8 **2.8 MISCELLANEOUS FRAMING AND SUPPORTS**

- 9 A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- 10 B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to
- 11 sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and
- 12 supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- 13 1. Furnish inserts if units are installed after concrete is placed.
- 14 C. Prime miscellaneous framing and supports with zinc-rich primer where indicated.
- 15

16 **2.9 LOOSE BEARING AND LEVELING PLATES**

- 17 A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to
- 18 receive anchor bolts and for grouting.
- 19 B. Prime plates with zinc-rich primer.
- 20

21 **2.10 STEEL WELD PLATES AND ANGLES**

- 22 A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction
- 23 as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for
- 24 embedding in concrete.
- 25

26 **2.11 FINISHES, GENERAL**

- 27 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for
- 28 applying and designating finishes.
- 29 B. Finish metal fabrications after assembly.
- 30

31 **2.12 STEEL AND IRON FINISHES**

- 32 A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements
- 33 indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal
- 34 fabrications:
- 35 1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3,
- 36 "Commercial Blast Cleaning."
- 37 2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- 38 B. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes
- 39 and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply
- 40 with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop
- 41 painting.
- 42 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- 43 C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware
- 44 and with ASTM A 123/A 123 M for other steel and iron products.
- 45

46 **PART 3 - EXECUTION**

47

48 **3.1 INSTALLATION, GENERAL**

- 49 A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set
- 50 metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and
- 51 free of rack; and measured from established lines and levels.
- 52 B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as
- 53 exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces
- 54 of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- 55 C. Field Welding: Comply with the following requirements:
- 56 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base
- 57 metals.
- 58 2. Obtain fusion without undercut or overlap.

- 1 3. Remove welding flux immediately.
- 2 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after
- 3 finishing and contour of welded surface matches that of adjacent surface.
- 4 D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required
- 5 to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle
- 6 bolts, through bolts, lag bolts, wood screws, and other connectors.
- 7 E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar
- 8 construction.
- 9

10 **3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS**

- 11 A. General: Install framing and supports to comply with requirements of items being supported, including
- 12 manufacturers' written instructions and requirements indicated on Shop Drawings.
- 13 B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts
- 14 embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
- 15 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as
- 16 specified in "Installing Bearing and Leveling Plates" Article.
- 17 C. Install pipe columns on concrete footings with grouted base plates. Position and grout column base plates as specified
- 18 in "Installing Bearing and Leveling Plates" Article.
- 19 1. Grout base plates of columns supporting steel girders after girders are installed and leveled.
- 20

21 **3.3 INSTALLING BEARING AND LEVELING PLATES**

- 22 A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.
- 23 Clean bottom surface of plates.
- 24 B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and
- 25 plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing
- 26 plate before packing with grout.
- 27 1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture;
- 28 use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
- 29 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- 30

31 **3.4 INSTALLATION OF METAL LADDERS**

- 32 A. Secure ladders to adjacent construction with the clip angles attached to the stringer.
- 33 B. Install brackets as required for securing of ladders welded or bolted to structural steel or built into masonry or
- 34 concrete.
- 35

36 **3.7 ADJUSTING AND CLEANING**

- 37 A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint
- 38 uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching
- 39 up shop-painted surfaces.
- 40 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- 41 B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with
- 42 ASTM A 780.
- 43
- 44

END OF SECTION

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**SECTION 05 51 13
METAL PAN STAIRS AND RAILINGS**

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Preamsembled steel stairs with concrete-filled treads.
 - 2. Steel tube railings and guardrails attached to metal stairs.
 - 3. Steel tube handrails attached to walls adjacent to metal stairs.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs, railings, and guardrails.
 - 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
 - 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.
- D. Schedule installation of railings so wall attachments are made only to completed walls.
 - 1. Do not support railings and guardrails temporarily by any means that do not satisfy structural performance requirements.

1.3 SUBMITTALS

- A. Product Data: For metal pan stairs and the following:
 - 1. Prefilled metal-pan-stair treads.
 - 2. Handrail wall brackets.
 - 3. Grout.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
 - 3. Include plan at each level.
 - 4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
- C. Sustainable Design Submittals
 - 1. Building Product Disclosure and Optimization: Sourcing of raw materials and recycled content documentation for steel.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. 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."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
 - 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 - 2. Protect steel members and packaged materials from corrosion and deterioration.
 - 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

1 **PART 2 - PRODUCTS**

2 **2.1 MANUFACTURERS**

- 3 A. American Stair, Inc.
- 4 B. Breuer Metal Craftsmen.
- 5 C. Duvinage Sharon Stairs.
- 6 D. Or approved equal.

7 **2.2 DESIGN CRITERIA**

- 8 A. Accessibility Requirements: Applicable provisions in Department of Justice publication 2010 ADA Standards for
- 9 Accessible Design, ICC/ANSI A117.1, and state accessibility code.
- 10 B. Uniformity of Risers and Treads: Treads and risers have uniform dimensions between floors.
- 11 C. Guard Infill Design: Openings will not allow 4 inch diameter sphere passage.

12 **2.3 METALS**

- 13 A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to
- 14 view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- 15 B. Steel Plates, Shapes, and Bars: ASTM A 36.
- 16 C. Steel Tubing for Railings: ASTM A 500
- 17 D. Steel Pipe for Railings: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another
- 18 grade and weight are required by structural loads.
- 19 E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25, unless another grade is
- 20 required by design loads; exposed.
- 21 F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or] structural steel,
- 22 Grade 30, unless another grade is required by design loads.

23 **2.4 FASTENERS**

- 24 A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce
- 25 connections suitable for anchoring railings to other types of construction indicated.
- 26 B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated,
- 27 flat washers.
- 28 C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat
- 29 washers.
- 30 D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without
- 31 failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed
- 32 when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified
- 33 independent testing agency.
- 34 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or
- 35 ASTM F 1941/F 1941M, Class Fe/Zn 5, unless otherwise indicated.

36 **2.5 MISCELLANEOUS MATERIALS**

- 37 A. Handrail Wall Brackets: Cast nickel-silver, Cast aluminum, Cast bronze, Cast stainless steel, center of rail from face of
- 38 wall per drawings.
- 39 B. Welding Electrodes: Comply with AWS requirements.
- 40 C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout;
- 41 recommended by manufacturer for interior use; noncorrosive and non-staining; mixed with water to consistency
- 42 suitable for application and a 30-minute working time.
- 43 D. Stair Nosing: Subject to compliance with requirements provide STNC3 by Safe-T-Nose, or comparable product by one
- 44 of the following:
- 45 1. Nystrom.
- 46 2. Amstep Products.
- 47 3. Or approved equal.

48 **2.6 FABRICATION, GENERAL**

- 49 A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates,
- 50 and other components necessary to support and anchor stairs and platforms on supporting structure.
- 51 1. Join components by welding unless otherwise indicated.
- 52 2. Use connections that maintain structural value of joined pieces.

- 1 B. Assemble stairs and railings in shop to greatest extent possible.
- 2 1. Disassemble units only as necessary for shipping and handling limitations.
- 3 2. Clearly mark units for reassembly and coordinated installation.
- 4 C. Cut, drill, and punch metals cleanly and accurately.
- 5 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
- 6 2. Remove sharp or rough areas on exposed surfaces.
- 7 D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- 8 E. Form exposed work with accurate angles and surfaces and straight edges.
- 9 F. Weld connections to comply with the following:
- 10 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base
- 11 metals.
- 12 2. Obtain fusion without undercut or overlap.
- 13 3. Remove welding flux immediately.
- 14 4. Weld exposed corners and seams continuously unless otherwise indicated.
- 15 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards"
- 16 for Finish #2 - Completely sanded joint with some undercutting and pinholes okay.

17 **2.7 FABRICATION OF STEEL-FRAMED STAIRS**

- 18 A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Commercial Class, unless more
- 19 stringent requirements are indicated.
- 20 B. Stair Framing:
- 21 1. Fabricate stringers with steel channels as indicated on the Drawings.
- 22 a. Stringer Size: As indicated on Drawings.
- 23 b. Provide closures for exposed ends of channel and rectangular tube stringers.
- 24 c. Finish: Shop primed.
- 25 2. Construct platforms of steel channel headers and miscellaneous framing members as indicated on Drawings.
- 26 a. Provide closures for exposed ends of channel and rectangular tube framing.
- 27 b. Finish: Shop primed.
- 28 3. Weld stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate
- 29 and join so bolts are not exposed on finished surfaces. Where stairs are enclosed by gypsum board shaft-wall
- 30 assemblies, provide hanger rods or struts to support landings from floor construction above or below.
- 31 a. Locate hanger rods and struts where they do not encroach on required stair width and are within the
- 32 fire-resistance-rated stair enclosure.
- 33 4. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel
- 34 stair components before installing masonry.
- 35 C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness
- 36 needed to comply with performance requirements, but not less than 0.067 inch.
- 37 1. Steel Sheet: Uncoated steel sheet.
- 38 2. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by
- 39 concrete fill.
- 40 3. Shape metal pans to include nosing integral with riser.
- 41 4. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete
- 42 during fabrication.
- 43 5. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld
- 44 subplatforms to platform framing.
- 45 6. Finish: Factory primed.

46 **2.8 FABRICATION OF STAIR RAILINGS**

- 47 A. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes,
- 48 including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed
- 49 to withstand indicated loads.
- 50 1. Rails and Posts: See Drawings.
- 51 2. Picket Infill: See Drawings.
- 52 B. Structural Performance Requirements:
- 53 1. Handrails and Top Rails of Guards:
- 54 a. Uniform load of 50 lbf/ft applied in any direction.
- 55 b. Concentrated load of 200 lbf applied in any direction.
- 56 c. Uniform and concentrated loads need not be assumed to act uniformly.

- 1 2. Infill of Guards:
 - 2 a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
 - 3 b. Infill load and other loads need not be assumed to act concurrently.
- 4 C. Welded Connections: Fabricate railings with welded connections.
 - 5 1. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 - 6 2. Weld all around at connections, including at fittings.
 - 7 3. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base
 - 8 metals.
 - 9 4. Obtain fusion without undercut or overlap.
 - 10 5. Remove flux immediately.
 - 11 6. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 - Completely sanded
 - 12 joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.
- 13 D. Form changes in direction of railings as follows:
 - 14 1. By inserting prefabricated flush-elbow fittings of radius indicated.
- 15 E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration
- 16 required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise
- 17 deforming exposed surfaces of components.
- 18 F. Close exposed ends of railing members with prefabricated end fittings.
- 19 G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
 - 20 1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- 21 H. Connect posts to stair framing by direct welding unless otherwise indicated.
- 22 I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall
- 23 bracket loads through wall finishes to structural supports.
 - 24 1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation
 - 25 and overstressing of substrate.
- 26 J. Finish: Prime paint.

27 **2.9 FINISHES**

- 28 A. Finish metal stairs after assembly.
- 29 B. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool
- 30 Cleaning."
- 31 C. Apply shop primer to uncoated surfaces of metal stair components, except those to be embedded in concrete or
- 32 masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and
- 33 Maintenance Painting of Steel," for shop painting.
- 34 D. Primer Material:
 - 35 1. Shop Primer: SSPC Paint 15, Type 1, red oxide.

36 **PART 3 - EXECUTION**

37 **3.1 EXAMINATION**

- 38 A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance
- 39 with requirements.
 - 40 1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster
 - 41 assemblies.
- 42 B. Proceed with installation only after unsatisfactory conditions have been corrected.

43 **3.2 INSTALLING METAL PAN STAIRS**

- 44 A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal
- 45 stairs to in-place construction.
 - 46 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- 47 B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units
- 48 accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- 49 C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise
- 50 indicated.
 - 51 1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen
 - 52 surfaces prior to setting plates.
 - 53 a. Clean bottom surface of plates.
 - 54 b. Set plates for structural members on wedges, shims, or setting nuts.

- 1 c. Tighten anchor bolts after supported members have been positioned and plumbed.
- 2 d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing
- 3 with grout.
- 4 e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
- 5 1) Neatly finish exposed surfaces; protect grout and allow to cure.
- 6 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- 7 D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar
- 8 construction.
- 9 E. Fit exposed connections accurately together to form hairline joints.
- 10 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping
- 11 size limitations.
- 12 2. Comply with requirements for welding in "Fabrication, General" Article.
- 13 F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
- 14 1. Install abrasive nosings with anchors fully embedded in concrete.
- 15 2. Center nosings on tread width.
- 16 G. Install precast concrete treads with adhesive supplied by manufacturer.
- 17 H. Install precast terrazzo treads according to manufacturer's written instructions.

18 3.3 INSTALLING RAILINGS AND GUARDRAILS

- 19 A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
- 20 1. Space posts at spacing indicated or, if not indicated, as required by design loads.
- 21 2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
- 22 3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for
- 23 sloping members do not exceed 1/4 inch in 12 feet.
- 24 4. Secure posts and rail ends to building construction as follows:
- 25 a. Anchor posts to steel by welding to steel supporting members.
- 26 b. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and
- 27 anchored with post-installed anchors and bolts.
- 28 B. Install railing gates level, plumb, and secure for full opening without interference.
- 29 1. Attach hardware using tamper-resistant or concealed means.
- 30 2. Adjust hardware for smooth operation.
- 31 C. Attach handrails to wall with wall brackets.
- 32 1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- 33 2. Secure wall brackets to building construction as follows:
- 34 a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
- 35 b. For hollow masonry anchorage, use toggle bolts.
- 36 c. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate
- 37 with stud installation to locate backing members.
- 38 d. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel
- 39 reinforcements.
- 40 e. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through
- 41 concealed steel reinforcements.

42 3.4 CLEANING

- 43 A. Clean primed steel surfaces of substances that would impair bond of finish paint.
- 44 B. Remove stains from concrete tread surfaces.
- 45 C. Clean surfaces that would impair adhesive bond of resilient stair accessories.

46 **END OF SECTION**

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**SECTION 05 73 00
DECORATIVE METAL RAILINGS**

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stainless steel decorative railings.

1.2 COORDINATION AND SCHEDULING

- A. Coordinate installation of anchorages for railings. 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 items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of decorative metal railings assembled from standard components.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings: Include plans, elevations, sections, and attachment details.
 - 1. For illuminated railings, include wiring diagrams and roughing-in details.
- D. Samples for Verification: For each type of exposed finish required.
- E. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

- 1 B. Structural Performance: Railings, including attachment to building construction, are to withstand the effects of gravity
2 loads and the following loads and stresses within limits and under conditions indicated:
- 3 1. Handrails and Top Rails of Guards:
- 4 a. Uniform load of 50 lbf/ft. applied in any direction.
5 b. Concentrated load of 200 lbf applied in any direction.
6 c. Uniform and concentrated loads need not be assumed to act concurrently.
- 7 2. Infill of Guards:
- 8 a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
9 b. Infill load and other loads need not be assumed to act concurrently.
- 10 C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior
11 railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other
12 detrimental effects.
- 13 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

14 **2.2 METALS, GENERAL**

- 15 A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade
16 names, stains, discolorations, or blemishes.
- 17 B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

18 **2.3 STAINLESS STEEL DECORATIVE RAILINGS**

- 19 A. Stainless Steel Decorative Railings:
- 20 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may
21 be incorporated into the Work include, but are not limited to, the following:
- 22 a. Atlantis Rail Systems
23 b. HDI Railings
24 c. Hollaender Architectural Railing Systems; Hollaender Mfg. Co.
- 25 2. Source Limitations: Obtain stainless steel decorative railing components from single source from single
26 manufacturer.
- 27 B. Tubing: ASTM A554, Grade MT 304.
- 28 C. Pipe: ASTM A312/A312M, Grade TP 304.
- 29 D. Castings: ASTM A743/A743M, Grade CF 8 or CF 20.
- 30 E. Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 304.
- 31 F. Flat Bar: ASTM A666, Type 304.
- 32 G. Bars and Shapes: ASTM A276/A276M, Type 304.
- 33 H. Illuminated Hand Rails: Provide internal illumination using concealed, internally wired, integrated LED lamps to
34 illuminate walking surfaces adjacent to railings without light leaks. Make provisions for servicing and for concealed
35 connection to electric service.
- 36 1. LED Luminaires: Comply with Section 26 5600 "Exterior Lighting."

37 **2.4 FASTENERS**

- 38 A. Fastener Materials:
- 39 1. Stainless Steel Railing Components: Type 304 stainless steel fasteners.
40 2. Finish exposed fasteners to match appearance, including color and texture, of railings.
- 41 B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce

- 1 connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.
- 2 C. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance
- 3 with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
- 4 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM
- 5 F593 and nuts, ASTM F594.

6 **2.5 MISCELLANEOUS MATERIALS**

- 7 A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- 8 1. For stainless steel railings, provide type and alloy as recommended by producer of metal to be welded and as
- 9 required for color match, strength, and compatibility in fabricated items.
- 10 B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM
- 11 C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- 12 C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for
- 13 mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
- 14 1. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water
- 15 exposure without needing protection by a sealer or waterproof coating and that is recommended by
- 16 manufacturer for exterior use.

17 **2.6 FABRICATION**

- 18 A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details,
- 19 finish, and anchorage, but not less than that required to support structural loads.
- 20 B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as
- 21 necessary for shipping and handling limitations.
- 22 C. Cut, drill, and punch metals cleanly and accurately.
- 23 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
- 24 2. Remove sharp or rough areas on exposed surfaces.
- 25 D. Form work true to line and level with accurate angles and surfaces.
- 26 E. Connections: Fabricate railings with welded connections unless otherwise indicated.
- 27 F. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose.
- 28 Weld all around at connections, including at fittings.
- 29 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base
- 30 metals.
- 31 2. Obtain fusion without undercut or overlap.
- 32 3. Remove flux immediately.
- 33 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for
- 34 Finish #1 welds; ornamental quality with no evidence of a welded joint.
- 35 G. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member
- 36 throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- 37 H. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as
- 38 railings.
- 39 I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and
- 40 anchors to interconnect railing members to other Work unless otherwise indicated.
- 41 J. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not
- 42 less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

1 **2.7 GENERAL FINISH REQUIREMENTS**

- 2 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying
3 and designating finishes.
- 4 B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering
5 before shipment.

6 **2.8 STAINLESS STEEL FINISHES**

- 7 A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- 8 B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
- 9 1. Run grain of directional finishes with long dimension of each piece.
- 10 2. When polishing is completed, passivate and rinse surfaces.
- 11 3. Remove embedded foreign matter and leave surfaces chemically clean.
- 12 C. Stainless Steel Tubing Finishes:
- 13 1. 180-Grit Polished Finish: Uniform, directionally textured finish.
- 14 D. Stainless Steel Sheet and Plate Finishes:
- 15 1. Directional Satin Finish: ASTM A480/A480M, No. 4.

16 **PART 3 - EXECUTION**

17 **3.1 EXAMINATION**

- 18 A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of
19 concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not
20 already done.

21 **3.2 INSTALLATION, GENERAL**

- 22 A. Perform cutting, drilling, and fitting required for installing railings.
- 23 1. Fit exposed connections together to form tight, hairline joints.
- 24 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
- 25 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
- 26 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication
27 and that are intended for field connection by mechanical or other means without further cutting or fitting.
- 28 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- 29 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and
30 ramps for sloping members do not exceed 1/4 inch in 12 feet.

31 **3.3 RAILING CONNECTIONS**

- 32 A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with
33 requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

34 **3.4 ANCHORING POSTS**

- 35 A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted
36 into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply
37 with anchoring material manufacturer's written instructions.

- 1 B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete.
- 2 Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink,
- 3 nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- 4 C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- 5 D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

6 **3.5 CLEANING**

- 7 A. Clean stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

8 **3.6 PROTECTION**

- 9 A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by
- 10 railing manufacturer. Remove protective coverings at time of Substantial Completion.
- 11 B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work.
- 12 Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or
- 13 provide new units.

14 **END OF SECTION**

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SUMMARY

- A. The work under this Section includes all labor, material, equipment and related services necessary to install blocking.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-related product.
- B. Include data for fire-retardent treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. Sustainable Design Submittals: Chain-of-Custody Qualification Data: For manufacturer and vendor.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.
- C. 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 E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 – PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
- C. Factory mark each piece of lumber with grade stamp of grading agency.
- D. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 PRESSURE TREATED LUMBER

- A. Roofing and Exterior Wall Assemblies: Wood blocking; Category UC3a.

2.3 FIRE-RETARDANT-TREATED LUMBER

- A. Where fire-retardant-treated materials are indicated, materials are to comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

- 1 B. Fire-Retardant-Treated Lumber by Pressure Process: Products with a flame-spread index of 25 or less when
- 2 tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test
- 3 is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the
- 4 centerline of the burners at any time during the test.
- 5 C. Treatment is not to promote corrosion of metal fasteners.
- 6
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8 **2.4 MISCELLANEOUS LUMBER**

- 9 A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction,
- 10 including the following:
- 11 1. Blocking
- 12 B. For items of dimension lumber size, provide Construction No. 2 grade lumber with 19 percent maximum
- 13 moisture content of any northern species; NLGA.
- 14
- 15

16 **2.5 FASTENERS**

- 17 A. Fasteners for metal substrate: Of type, material, size, corrosion resistance, holding power, and other properties
- 18 required to fasten steel members to substrates.
- 19 B. Fasteners to be compatible with wood treatment.
- 20
- 21

22 **PART 3 – EXECUTION**

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25 **3.1 INSTALLATION**

- 26 A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough
- 27 carpentry to other construction; scribe and cope as needed for accurate fit. Locate blocking and similar supports
- 28 to comply with requirements for attaching other construction.
- 29 B. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as
- 30 required for true line and level of attached work. Coordinate locations with other work involved.
- 31 C. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless
- 32 otherwise indicated.
- 33 D. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads
- 34 indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.
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36 **END OF SECTION**

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SECTION 06 15 43
CROSS LAMINATED TIMBER PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes Cross Laminated Timber (CLT) Roof Panels as shown in the Construction Drawings.
- B. Related Sections:
 - 1. Division 01 - General Requirements
 - 2. Division 05- Metals
 - 3. Division 06 - Glued Laminated Construction
 - 4. Division 06 - Rough Carpentry
 - 5. Division 09-Finishes

1.2 REFERENCES

- A. APA Standard for Performance-Rated CLT-ANSI/APA PRG 320/2012.
- B. ANSI/AWC NDS-2012 National Design Specification for Wood Construction

1.3 SUBMITTALS

- A. Product Data: APA Product Report for each grade and type of product indicated on the drawings.
- B. Shop Drawings: Submit Shop Drawings in accordance with the drawings and other specification sections. Shop Drawings shall indicate the following:
 - 1. Panel layout, including plans and elevations. Dimensions, shapes and sections, openings, support conditions, and connections shall also be indicated.
 - 2. Indicate stress grade and identify span direction. Clearly mark each panel type on the drawing.
 - 3. Indicate location of CLT panel by same identification mark placed on panel.
 - 4. Indicate lifting connections locations where applicable.
 - 5. Indicate locations, tolerances, and details of anchorage to supporting structure.
 - 6. Include and locate openings 12 inches or larger.
 - 7. Indicate relationship of CLT panels to adjacent structural elements.
 - 8. Where applicable, provide three dimensional models of building identifying CLT panel construction.
- C. Structural design calculations: Provide CLT structural design calculations for panels, connections and shop drawings stamped by a qualified Professional Engineer registered in the state of Wisconsin
- D. Samples:
 - 1. Submit 3 sample(s) of CLT panel approximately 12" by 12" for field applied coatings by others.
- E. VOC Content: Product data and material safety data sheets (MSDS) for the CLT adhesive used on the interior of the building indicating chemical composition and

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Certified by APA The Engineered Wood Association for compliance with ANSI/APA PRG 320/2012.
- B. Design Standards:

1. National Design Specification for Wood Construction N:S-2012.
2. CLT Design Handbook-USEdition.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Support and protect CLT during shipment to eliminate damage to the panels.
- B. All material shall be stored level, off the ground, and protected from the weather, sunlight and construction activities.
- C. Place stored units so identification marks are clearly visible and in order of installation sequence.
- D. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause cracking or damage. Protect panel corner and edges as required during handling of panels.
- E. Lift and support units only at designated points shown on Shop Drawings or determined in the field by specialty lifting engineer.
- F. Maintain protection of CLT panel at all times during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products as indicated on drawings and able to comply with 1.5 A.1.

2.2 MATERIALS

- A. Wood Species: No.2 Spruce-Pine-Fir
- B. CLT Grade: SL-V4
- C. Adhesives: Comply with ANSI/ AITC A190.1 - Purbond HBE452 or equal
- D. Sealant for "wet service" condition

2.3 ACCESSORIES

- A. Screws, lag bolts and bolts as specified on the drawings, and designed by the CLT engineer.
- B. Miscellaneous straps and metals as specified on the drawings.
- C. Wrapping Material: Weatherproof, lightproof, stain free material. Cut holes on site and underside of wrapping to avoid accumulation of condensation.

2.4 FABRICATION

- A. Fabricate CLT panels in accordance with ANSI/APA PRG 320/2012 except where specified otherwise and to following classifications. Use multiple layers of 1-3/8" thick laminations.
- B. Service grade: "Wet service"
- C. Appearance Classification:
 1. Non-Visual (where panels are concealed):
 - a. Shake and checks allowed, shall not exceed 36" or 114 of the length.
 - b. Heart or blue stain allowed, not limited.
 - c. Knots well-spaced, quantity not limited.

- 1 d. Minimal wane on face.
2 e. Side pressure on exposed face not required.
3 2. Visual (where panels are in view in final construction):
4 a. Utilize SPF-s or DF lx Veneer, No.3 grade lumber
5 b. Knots: Select tight knot.
6 c. Pitch streaks not permitted.
7 d. Wane on face not permitted.
8 e. Side pressure on exposed faces required.
9 f. Sand surface for finish {as required by other divisions)
10
11 D. CLT panels to be fabricated without a chamfer along edges.
12
13 E. CLT panels to be joined at panel edges as indicated on the shop drawings.
14
15 F. Mark members for identification during erection. Ensure that marks will be concealed in
16 final assembly for appearance grade members. Clearly mark top surface.
17
18 G. Coat all cuts, holes and slots.
19
20 H. Field apply sealer to all sides of laminated members. Double coat ends of laminated
21 members.
22
23 I. All miscellaneous steel connecting CLT panel elements to each other shall be
24 detailed, and if supplied. test fitted in the shop by the CLT supplier.
25
26

27 PART 3 - EXECUTION

28 3.1 EXAMINATION:

- 29 A. Prior to fabrication, check all dimensions relating to this section of work.
30 Report any discrepancies to Engineer.
31
32 B. Prior to site erection, examine all site conditions relating to this section of work to
33 ensure that they are acceptable for a satisfactory installation. Report any
34 discrepancies to the engineer and manufacturer.
35
36

37 3.2 INSTALLATION

- 38 A. Install CLT floor and roof panels to comply with manufacturer's written instructions
39
40 1. Locate end joints for two-span condition lay-up.
41 2. Fasten panels to structure below per approved (submitted) fastening pattern to develop diaphragm
42 forces and uplift pressures.
43
44
45

46 3.3 ERECTION TOLERANCES

- 47 A. Erect CLT floor and roof panels in accordance with approved shop drawings.
48
49 B. Make adequate provisions for erection stresses. Set members level and plumb to correct positions. Securely
50 brace members and anchor in place to maintain plumb until permanently secured by finish structure.
51
52 C. Fit CTL floor and roof panel members closely and accurately, without trimming, cutting or other
53 modifications, unless approved by the EOR.
54
55 D. Site cutting or boring of CLT floor and roof Panels, other than shown on shop drawings is not permitted
56 without a written consent of EOR.
57
58
59

1 **3.4** **FIELD QUALITY CONTROL**

- 2
- 3 A. Special Inspections: Owner will engage a qualified special inspector to perform the following special
- 4 inspections:
- 5
- 6 1. Inspect connections of CLT floor and roof panels to structure and between panels in accordance
- 7 with approved shop drawings and contract documents.
- 8
- 9 B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- 10
- 11 C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- 12
- 13 D. Additional testing and inspecting, at Contractor's expense, will be performed to determine
- 14 compliance of replaced or additional work with specified requirements.
- 15
- 16 E. Prepare test and inspection reports.
- 17

18

19 **3.5** **CLEANING**

- 20
- 21 A. Clean exposed surfaces of CLT floor and roof panels after erection and completion of field touch up.
- 22
- 23 1. Perform cleaning procedures, if necessary, according to CLT manufacturer's written
- 24 recommendations. Protect other work from staining or damage due to cleaning operations.
- 25 2. Do not use cleaning materials or processes that could change the appearance of exposed CLT floor
- 26 and roof panels or damage adjacent materials.
- 27

28 **END OF SECTION**

**SECTION 06 1600
SHEATHING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Wall sheathing.
 - 2. Flexible flashing at openings in sheathing.
 - 3. Sheathing joint-and-penetration treatment.

1.2 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. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 - 3. Environmental Product Declarations: For each product.

1.3 QUALITY ASSURANCE

- A. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - 1. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by G-P Gypsum, or approved equal.
 - 2. Core: 5/8 inch, unless indicated otherwise.
 - 3. Type X.
 - 4. In locations indicated on Drawings as required for non-combustible exterior wall sheathing.
- B. General: Provide fasteners of size and type indicated.
 - 1. For wall sheathing panels, provide fasteners with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.2 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing Board: Elastomeric silicone joint sealant recommended by sheathing manufacturer.
- B. Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fiber tape, of type recommended by sheathing and tape manufacturers.

2.3 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

- 1 1. For wall sheathing, provide fasteners with hot-dip coating complying with ASTM A153/A153M or of Type 304
- 2 stainless steel.
- 3 B. Nails, Brads, and Staples: ASTM F1667.
- 4 C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction,
- 5 based on ICC-ES AC70.
- 6 D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended
- 7 by sheathing manufacturer for thickness of sheathing to be attached.
- 8 1. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.
- 9

10 **PART 3 - EXECUTION**

11

12 **3.1 INSTALLATION, GENERAL**

- 13 A. Do not use materials with defects that impair the quality of sheathing or pieces that are too small to use with
- 14 minimum number of joints or optimum joint arrangement.
- 15 B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless
- 16 otherwise indicated.
- 17 C. Securely attach to substrate by fastening as indicated, complying with the following:
- 18 1. NES NER-272 for power-driven fasteners.
- 19 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- 20 D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in
- 21 sequence and manner that exclude exterior moisture.
- 22 E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support
- 23 elements.
- 24 F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed
- 25 to precipitation or left exposed at end of the workday when rain is forecast.
- 26

27 **3.2 GYPSUM SHEATHING INSTALLATION**

- 28 A. Comply with GA-253 and with manufacturer's written instructions.
- 29 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
- 30 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
- 31 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials.
- 32
- 33 B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- 34 C. Horizontal Installation: Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less
- 35 than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
- 36 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of
- 37 boards.
- 38 D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those
- 39 of adjacent boards. Attach boards at perimeter and within field of board to each stud.
- 40 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of
- 41 boards.
- 42 E. Protect sheathing by covering exposed exterior surface of sheathing with air/vapor barrier.
- 43

44 **3.3 SHEATHING JOINT-AND-PENETRATION TREATMENT**

- 45 A. Seal sheathing joints according to sheathing manufacturer's written instructions.
- 46 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Seal other penetrations and openings.
- 47 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing board joints, and apply and trowel silicone
- 48 emulsion sealant to embed tape in sealant. Apply sealant to exposed fasteners. Seal other penetrations and
- 49 openings.
- 50 3. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing.
- 51 Apply at upstanding flashing to overlap both flashing and sheathing.
- 52

53 **3.4 FLEXIBLE FLASHING INSTALLATION**

- 54 A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
- 55 1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other
- 56 construction, laps need not exceed flange width.
- 57 2. Lap flashing over weather-resistant building paper at bottom and sides of openings.
- 58 3. Lap weather-resistant building paper over flashing at heads of openings.

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4. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

END OF SECTION

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**SECTION 06 18 00
GLUED-LAMINATED CONSTRUCTION**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Structural glued-laminated timber.
- 7 2. Timber connectors.
- 8 B. Related Requirements:
- 9 1. Section 06 15 43 "Cross Laminated Timber Panels

10 **1.2 DEFINITIONS**

- 11 A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected
- 12 and prepared wood laminations bonded together with adhesives and with the grain of the laminations
- 13 approximately parallel longitudinally.

14 **1.3 ACTION SUBMITTALS**

- 15 A. Product Data: For each type of product.
- 16 1. Include data on lumber, adhesives, fabrication, and protection.
- 17 2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions
- 18 for handling, storing, installing, and finishing treated material.
- 19 3. For connectors. Include installation instructions.
- 20 B. Shop Drawings:
- 21 1. Show layout of structural glued-laminated timber system and full dimensions of each member.
- 22 2. Indicate species and laminating combination.
- 23 3. Include large-scale details of connections.
- 24 C. Samples: Full width and depth, 24 inches long, showing the range of variation to be expected in appearance of
- 25 structural glued-laminated timber.
- 26 1. Apply specified factory finish to three sides of half length of each Sample.
- 27 D. Delegated Design Submittal: For structural glued-laminated timber and timber connectors.

28 **1.4 INFORMATIONAL SUBMITTALS**

- 29 A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-
- 30 laminated timber complies with requirements in ANSI A190.1.
- 31 B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative
- 32 used and net amount of preservative retained.
- 33 C. Research/Evaluation Reports: For structural glued-laminated timber, from ICC-ES.

34 **1.5 QUALITY ASSURANCE**

- 35 A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed firm.

36 **1.6 DELIVERY, STORAGE, AND HANDLING**

- 37 A. General: Comply with provisions in AITC 111.
- 38 B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

1 **PART 2 - PRODUCTS**

2 **2.1 PERFORMANCE REQUIREMENTS**

- 3 A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality
4 Requirements," to design structural glued-laminated timber and connectors.
- 5 B. Structural Performance: Structural glued-laminated timber and connectors are to withstand the effects of structural
6 loads shown on Drawings without exceeding allowable design working stresses listed in ANSI 117 or determined
7 according to ASTM D3737 and acceptable to authorities having jurisdiction.

8 **2.2 STRUCTURAL GLUED-LAMINATED TIMBER**

- 9 A. General: Provide structural glued-laminated timber that complies with ANSI A190.1 and ANSI 117 or
10 research/evaluation reports acceptable to authorities having jurisdiction.
- 11 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS
12 trademark. Place mark on surfaces that are not exposed in the completed Work.
- 13 2. Provide structural glued-laminated timber made from single species.
- 14 3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated
15 veneer lumber.
- 16 4. Provide structural glued-laminated timber made with wet-use adhesive complying with ANSI A190.1.
- 17 B. Species and Grades for Structural Glued-Laminated Timber:
- 18 1. Southern pine in grades needed to comply with "Performance Requirements" Article.
- 19 C. Species and Grades: For beams and purlins.
- 20 1. Species and Beam Stress Classification: Southern pine, 30F-2.1E.
- 21 2. Lay-up: Either balanced or unbalanced.
- 22 D. Species and Grades for Columns:
- 23 1. Species and Combination Symbol: Southern pine, 47.
- 24 E. Appearance Grade: Architectural, complying with AITC 110.
- 25 1. For Premium and Architectural appearance grades, fill voids as required by AITC 110.

26 **2.3 TIMBER CONNECTORS**

- 27 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 28 1. Simpson Strong-Tie Co., Inc.
- 29 2. USP Structural Connectors.
- 30 B. Fabricate beam seats from steel with 3/8-inch bearing plates, 3/4-inch- diameter-by-12-inch- long deformed bar
31 anchors, and 0.239-inch side plates.
- 32 C. Fabricate arch base shoes from steel with 1-inch baseplates and 3/8-inch side plates.
- 33 D. Fabricate beam hangers from steel with 0.179-inch stirrups and 0.239-inch top plates.
- 34 E. Fabricate hinge connectors from steel with 0.179-inch side plates and 3/4-inch top and bottom plates.
- 35 F. Fabricate strap ties from steel , 3 inches wide by 0.239 inch thick.
- 36 G. Fabricate tie rods from round steel bars with upset threads connected with forged-steel turnbuckles complying with
37 ASTM A668/A668M.
- 38 H. Provide bolts, 3/4 inch unless otherwise indicated, complying with ASTM A307, Grade A; nuts complying with
39 ASTM A563; and, where indicated, flat washers.
- 40 I. Provide shear plates, 4 inches in diameter, complying with ASTM D5933.
- 41 J. Materials: Unless otherwise indicated, fabricate from the following materials:
- 42 1. Structural-steel shapes, plates, and flat bars complying with ASTM A36/A36M.
- 43 2. Round steel bars complying with ASTM A575, Grade M 1020.
- 44 3. Hot-rolled steel sheet complying with ASTM A1011/A1011M, Structural Steel, Type SS, Grade 33.
- 45 K. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.

46 **2.4 MISCELLANEOUS MATERIALS**

- 47 A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the
48 transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- 49 B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with
50 indicated finish.

1 **2.5 FABRICATION**

- 2 A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 3 1. Dress exposed surfaces as needed to remove planing and surfacing marks.
- 4 B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- 5 C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- 6 D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

10 **2.6 FACTORY FINISHING**

- 11 A. Clear Finish: Manufacturer's standard, resistant to mildew and fungus.
 - 12 1. Water repellent.
 - 13 2. Film-forming two-coat, varnish.
- 14 B. Semitransparent Stain Finish: Manufacturer's standard oil-based stain, resistant to mold and fungus.
 - 15 1. Color: Match Architect's sample.
- 16 C. Solid-Color Stain Finish: Manufacturer's standard oil-based penetrating stain, resistant to mildew and fungus.
 - 17 1. Color: Match Architect's sample.
- 18 D. Painted Finish: Acrylic latex system.
 - 19 1. Prime Coat: Stain blocking primer as recommended by topcoat manufacturer.
 - 20 2. Intermediate Coat: Matching topcoat.
 - 21 3. Topcoat: High-performance architectural coating, low sheen.
 - 22 4. Color: Match Architect's sample.

23 **PART 3 - EXECUTION**

24 **3.1 EXAMINATION**

- 25 A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.
- 26 B. Proceed with installation only after unsatisfactory conditions have been corrected.

28 **3.2 INSTALLATION**

- 29 A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 30 1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- 31 B. Framing Built into Masonry: Provide 1/2-inch clearance at tops, sides, and ends of members built into masonry; bevel cut ends 3 inches; and do not embed more than 4 inches unless otherwise indicated.
- 32 C. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- 33 D. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
 - 34 1. Predrill for fasteners using timber connectors as templates.
 - 35 2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 36 3. Coat cross cuts with end sealer.
- 37 E. Install timber connectors as indicated.
 - 38 1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
 - 39 2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

- 1 **3.3 ADJUSTING**
2 A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated
3 timber if repairs are not approved by Architect.

- 4 **3.4 PROTECTION**
5 A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including
6 protection from weather, sunlight, soiling, and damage from work of other trades.
7 1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
8 2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

9 END OF SECTION

SECTION 06 4116
PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic-laminate-clad architectural cabinets.
 - 2. Cabinet hardware and accessories.
 - 3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.2 ACTION SUBMITTALS

- A. Samples: For each exposed product and for each color and texture specified.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Sustainable Design Submittals:
 - 1. Environmental Product Declarations: For each product.
 - 2. Third-Party Certified Life Cycle Assessment: For each product.
 - 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
 - 4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels from certification program indicating that woodwork complies with requirements of grades specified.
- B. Architectural Woodwork Standards Grade: Premium .
- C. Type of Construction: Frameless .
- D. Door and Drawer-Front Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Laminart LLC.
 - c. Wilsonart LLC.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Vertical Surfaces and Edges: Grade VGS.
 - a. Color and Pattern: See Drawings.
 - 2. Edges: Grade VGS PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
 - 3. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
 - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners .
- I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.
- J. Post-rolled leading edge and integral 4-inch backsplash and side splash.

2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

- 1 B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each
- 2 type of architectural cabinet and quality grade specified unless otherwise indicated.
- 3 1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
- 4 2. Products shall be made without urea formaldehyde.
- 5 3. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer
- 6 recycled content not less than 15 percent.
- 7

8 **2.3 CABINET HARDWARE AND ACCESSORIES**

- 9 A. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 170 degrees of opening.
- 10 B. Wire Pulls: Back mounted bar pulls, solid metal, brushed nickel finish.
- 11 C. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081 .
- 12 D. Drawer Slides: ANSI/BHMA A156.9.
- 13 1. Standard Duty (Grade 1 and Grade 2): Side mount .
- 14
- 15 E. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.
- 16 F. Door and Drawer Locks: ANSI / BHMA A156.11.
- 17 1. All locks to be keyed the same.

18 **2.4 MISCELLANEOUS MATERIALS**

- 19 A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber , kiln-dried to less than 15 percent
- 20 moisture content.
- 21 B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal
- 22 expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors
- 23 and inserts at inside face of exterior walls and at floors.
- 24 C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public
- 25 Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources
- 26 Using Environmental Chambers."
- 27 1. Adhesive for Bonding Edges: Hot-melt adhesive.
- 28 2. Adhesive for Bonding Plastic Laminate: Contact cement.
- 29

30 **2.5 FABRICATION**

- 31 A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to
- 32 Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at
- 33 site, provide ample allowance for scribing, trimming, and fitting.
- 34 B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items.
- 35 Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped
- 36 openings. Sand edges of cutouts to remove splinters and burrs.

37 **PART 3 - EXECUTION**

38 **3.1 INSTALLATION**

- 39 A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- 40 B. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be
- 41 installed.
- 42 C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet
- 43 installation screws.
- 44 D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
- 45 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- 46 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust
- 47 hardware to center doors and drawers in openings and to provide unencumbered operation. Complete
- 48 installation of hardware and accessory items as indicated.
- 49 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.
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END OF SECTION

SECTION 06 42 19
PLASTIC-LAMINATE-CLAD WOOD PANELING

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PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plastic laminate wood paneling for under-cabinet aprons.

1.2 SUBMITTALS

- A. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, and finishing materials and processes.
- B. Samples:
 - 1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one (1) sample applied to core material and specified edge material applied to one (1) edge.

1.3 QUALITY ASSURANCE

- A. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Fabricator Qualifications: Shop that employs skilled workers who specialize in fabricating products similar to those required for this Project and whose products have a record of successful in-service performance with a minimum of three (3) years documented experience.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Manual of Millwork."

1.4 COORDINATION

- A. Coordinate work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver items only when proper storage conditions will be available. Store in protected area until ready for installation.
- B. Maintain optimum humidity and temperature for conditions after receipt of materials.
- C. Store in a manner to allow free circulation of air around all items.
- D. Maintain temperature of casework storage areas between 50 to 75 deg F.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace materials with material or workmanship defects within specified warranty period.
 - 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD WOOD PANELING

- A. Grade: Custom.
- B. Color: As selected by Architect from laminate manufacturer's full range.
- C. Panel Core: Particleboard or MDF.
 - 1. Thickness: 3/4 inch.
- D. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD3, grades as indicated, or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Pionite.
 - d. Wilsonart International; Div. of Premark International, Inc.

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2.2 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.3 FABRICATION

- A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
 - 1. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.
- B. Plastic-Laminate Supports/Aprons:
 - 1. AWI Type of Cabinet Construction: Flush overlay.
 - a. Horizontal Surfaces Other Than Tops: Grade HGS.
 - b. Post formed Surfaces: Grade HGP.
 - c. Vertical Surfaces: Grade HGS.
 - d. Edges: Grade HGS.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

3.2 PREPARATION

- A. Provide anchoring devices for installation and embedding.
- B. Provide templates and rough-in measurements.

3.3 INSTALLATION OF APRONS

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with not more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
- C. Anchor paneling to supporting substrate with splined connection strips. Do not use fastening unless covered by trim or otherwise indicated.

3.4 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean paneling as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.
- B. Repair damaged and defective work.
- C. Leave all surfaces clean and without defects.

END OF SECTION

**SECTION 06 61 00
CAST POLYMER FABRICATIONS**

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3 **PART 1 GENERAL**

4 **1.1 SECTION INCLUDES**

- 5 A. Solid surface wall panels.
- 6 B. Solid surface windowsills.

7 **1.2 SUBMITTALS**

- 8 A. Product Data: Manufacturer's data for fabricated units.
- 9 B. Shop Drawings: For each type of cast polymer, indicate:
 - 10 1. Plans and Elevations: Include dimensions and unit serial numbers; indicate location of fabricated units.
- 11 C. Samples: For each type.

12 **1.3 DELIVERY, STORAGE, AND HANDLING**

- 13 A. Deliver products to project site in original packages, containers, or bundles bearing brand name and identification.
- 14 B. Store products under cover, elevated above grade, and in dry, well-ventilated areas not exposed to heat or
- 15 sunlight. Protect from moisture damage.
- 16 C. Handle products to prevent damage to edges, ends, or surfaces, and in accordance with manufacturer's written
- 17 instructions.

18 **1.4 WARRANTY**

- 19 A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- 20 B. Manufacturer Warranty: Provide 2-year manufacturer warranty. Complete forms in Owner's name and register
- 21 with manufacturer.
- 22 C. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include
- 23 provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and
- 24 register with warrantor.

25 **PART 2 PRODUCTS**

26 **2.1 MANUFACTURERS**

- 27 A. Solid Surface Fabrications:
 - 28 1. Corian by DuPont - Basis-of-Design.
 - 29 2. Samsung Chemical USA..
 - 30 3. Wilsonart Contract.

31 **2.2 REGULATORY REQUIREMENTS**

- 32 A. Surface Burning Requirements:
 - 33 1. Interior Use: Flame spread index of 75 or less and smoke-development index of 450 or less; Class B interior
 - 34 finish classification when tested in accordance with ASTM E84.

35 **2.3 SOLID SURFACING FABRICATIONS**

- 36 A. Solid Surfacing: Densified, homogeneous, nonporous castings fabricated into sheets; composed of acrylic resins,
- 37 fillers, color chips, and pigment and performance-enhancing additives.
- 38 B. Applications: Wall panels and windowsills.
 - 39 1. Style: As indicated on drawings.
 - 40 2. Height: As indicated on drawings.
 - 41 3. Thickness: 5/16 inch (7.94 mm).
 - 42 4. Finish on Exposed Surfaces: Manufacturer's standard for application.
 - 43 5. Color: As indicated on Drawings.

44 **2.4 FABRICATIONS**

- 45 A. Fabricate units with embedded anchors, stiffening ribs, and sufficient strength for handling and placement stresses.
- 46 B. Fabricate cutouts where indicated.

- 1 C. Radius corners and edges with 1/4 inch (6.4 mm) minimum radius; polish exposed edges.
- 2 D. Provide consistent finish over exposed surfaces matching approved samples.
- 3 E. Fill seams and mold lines; grind smooth and finish to match adjacent cast polymer surfaces.
- 4 F. Fabricate components with joints tightly fitted and secured.
- 5 G. Fabrication Tolerances:
 - 6 1. Maximum Variation from Specified Thicknesses: 1/16 inch (1.59 mm).
 - 7 2. Maximum Variation from Specified Dimensions: 1/8 inch (3.18 mm).
 - 8 3. Maximum Variation from Dimensioned Cutout Locations: 1/4 inch (6.35 mm).

9 **2.5 ACCESSORIES**

- 10 A. General: Accessories recommended by cast polymer manufacturer for complete installation.
- 11 B. Adhesives: Type recommended by cast polymer manufacturer for application; not containing formaldehyde or
- 12 volatile organic compounds.
- 13 C. Joint Sealants: Type recommended by cast polymer manufacturer for application.

14 **PART 3 EXECUTION**

15 **3.1 EXAMINATION**

- 16 A. Verify field measurements are as indicated on shop drawings.
- 17 B. Verify substrates are prepared to receive cast polymer fabrications.
- 18 C. Verify mechanical, electrical, and other building components affecting work of this section are placed and ready to
- 19 receive work of this section.

20 **3.2 PREPARATION**

- 21 A. Prepare substrates in accordance with manufacturer's written instructions.

22 **3.3 INSTALLATION**

- 23 A. Install cast polymer units in accordance with manufacturer's written instructions.
- 24 B. Install cast polymer units in accordance with manufacturer's written instructions.
- 25 C. Align work plumb and level.

26 **3.4 TOLERANCES**

- 27 A. Maximum Variation from True Position: 1/4 inch (6.4 mm).
- 28 B. Maximum Variation from Plumb: 1/4 inch in 10 feet (2 mm in 1 m).
- 29 C. Maximum Variation from Level: 1/4 inch in 10 feet (2 mm in 1 m).

30 **3.5 CLEANING**

- 31 A. Clean exposed surfaces of installed units in accordance with manufacturer's instructions.

32 **3.6 PROTECTION**

- 33 A. Protect installed cast polymer units from subsequent construction operations.
- 34
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END OF SECTION

SECTION 06 64 00
GLASS FIBER-REINFORCED PLASTIC PANELS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Glass-Fiber-Reinforced Plastic (FRP) panels
 - a. Accessories
 - b. Adhesives
 2. Sealants for use with FRP Panels

1.2 REFERENCES

- A. ASTM International (ASTM) Publications: (Former American Society for Testing and Materials)
- B. D5319 "Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels"
- C. E84 "Standard Test Method for Surface Burning Characteristics of Building Materials"

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Submit Product Data for each type of product specified.
 2. Shop Drawings:
 - a. Show locations and panel layouts; materials and finishes; panel size, thickness and color.
 - b. Trim locations and types.
 - c. Anchorage type and spacing.
 - d. Installation methods; joint treatments; relationships with adjacent construction; and other pertinent information.
 3. Samples: Each product specified.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to job site in manufacturer's original, unopened, undamaged containers with identification labels intact. Materials are to be factory packaged on strong pallets.
- B. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Store panels in a dry indoor location. Remove any foreign matter from face of panel by using a soft bristle brush, avoiding abrasive action.

1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.
- B. Environmental Conditions, General: Establish and maintain environmental conditions including temperature and humidity for application of FRP work and with manufacturer's recommendations.
 1. Acclimatize panels 48 to 72 hours prior to installation.
- C. Room Temperatures: For attachment of FRP maintain not less than 50 deg. F. for 48 hours prior to application and continuously thereafter during the remainder of the construction period. Do not exceed 95 deg. F when using temporary heat sources.

1 **1.6 WARRANTY**

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3 A. Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace FRP
4 panels that fail in materials or workmanship within specified warranty period.

- 5
6 1. Failures shall include, but not be limited to, substantial defects in material and workmanship, rotting, rusting,
7 corrosion, development of structural surface cracks, or requiring painting or refinishing.
8 2. Warranty Period: Two (2) years from date of Substantial Completion.
9

10 B. Installer's Warranty: Installer's standard form in which installer agrees to repair or replace FRP panels that fail due
11 to poor workmanship or faulty installation within specified warranty period.

- 12
13 1. Warranty Period: Two (2) years from date of Substantial Completion.
14
15

16 **PART 2 PRODUCTS**

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18 **2.1 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS**

19
20 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 21 1. Crane Composites, Inc.
22 2. Marlite, Inc. – Basis of design.
23 3. Parkland Plastics.
24 4. Approved equal.
25

26 B. Materials:

- 27 1. At Kitchen and Janitor's Closet: Flat with embossed pebble surface texture; moisture resistant and impervious
28 to mold and mildew, complying with ASTM D5319.
29 2. At Dorm Bunk Dividing Walls: Marlite Symmetrix.
30 3. USDA approved.
31 4. Meet FDA requirements.
32 5. Surface Burning Characteristics: ASTM E84, Class A.
33 a. Flame Spread: 25 or less.
34 b. Fuel Contributed: 100 or less.
35 c. Smoke Developed: 100 or less.
36 6. Size: 0.090" (3/32) thick x 4' x 8'.
37 7. Color: White.
38

39 **2.2 ACCESSORIES**

40
41 A. Moldings:

- 42 1. PVC trim moldings by panel manufacturer.
43 2. Include inside and outside corners, end caps, cap edging, and division bars.
44 3. Color to match panels.
45

46 B. Anchors

- 47 1. Manufacturer's standard nylon drive rivets suitable for anchoring to substrate shown on Drawings.
48

49 **2.3 ADHESIVE**

50
51 A. Type recommended by panel manufacturer for the required substrates with a VOC content of 50 g/L or less.
52

53 **2.4 SEALANT**

54
55 A. Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling
56 manufacturer. Sealant shall have a VOC content of 250 g/L or less.
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PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas in which work is to be performed. Report in writing to Contractor all prevailing conditions that will adversely affect satisfactory execution of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting work constitutes acceptance of the existing conditions.

3.2 PREPARATION

- A. Surface preparation:
 - 1. Surface to which panels are to be applied must be smooth, solid.
 - 2. Clean surface of dirt, dust, grease or other matter which might interfere with adhesive bonding of panels to substrate.
- B. Pre-Sizing:
 - 1. Lay out and prefit each panel before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels so that trimmed panels at corners are not less than 12 inches wide.
 - 2. Cut as required to closely and neatly fit obstructions, nonstandard panel spacing, and penetrations.
 - 3. Maintain 1/8" around pipes, electrical fittings, obstructions, and other items penetrating panels, to allow for expansion.

3.3 INSTALLATION

- A. Install panels and moldings in accordance with manufacturer's written instructions.
 - 1. Adhesive Application:
 - a. Apply adhesive over entire back surface of panel using 3/16" V-notched trowel.
 - b. Adhesive coverage: 60 sq. ft. per gallon, or;
 - 2. Cohesive Method:
 - a. Skim coat adhesive on panel back and substrate.
 - b. Fan panel to verify bonding to substrate and adhesive curing time after installation.
- B. Install panels with edges vertical and plumb. Use maximum length pieces for minimum number of end joints.
- C. Pre-drill panel fastener holes slightly oversize to accommodate panel expansion to contraction.
- D. Secure upper and lower panel ends with nylon drive rivets, or with other non-corroding mechanical fasteners recommended by panel manufacturer.
 - 1. Space fasteners at 16" o.c.
 - 2. Drive fasteners to snug fit, but do not over tighten.
- E. Install and seal trim concurrently with panel installation.
- F. Remove excess sealant and smears as paneling is installed, or carefully trim off excess after sealant has cured.
- G. Seal joints and seams between panels or moldings and floor or base, ceiling, walls and penetrations.

3.4 CLEANING

- A. Remove labels, stains, and excess sealant.

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- B. Repair or replace any installed products that have been damaged.
- C. Clean panels using materials and methods recommended by manufacturer.
- D. Remove and lawfully dispose of construction debris away from Project Site.
- E. Protect installed product and finish surfaces from damage during remainder of construction.

END OF SECTION

**SECTION 07 05 33
FIRE AND SMOKE ASSEMBLY IDENTIFICATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior identification markings for fire and smoke assemblies per IBC 703.

1.2 REFERENCE STANDARDS

- A. Wisconsin Commercial Building (2009 IBC).

1.3 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of IBC.
- B. IBC 703.6 Marking and Identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces;
 - 2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition.
 - 3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.
 - a. Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify all substrate surfaces are ready to receive work.

3.2 INSTALLATION

- A. Locate markings as required by IBC.
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Substantial Completion; repair or replace damaged markings.

END OF SECTION

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**SECTION 07 14 16
COLD FLUID-APPLIED WATERPROOFING**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Cold fluid-applied waterproofing, vertical.

1.2 RELATED REQUIREMENTS

1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.
2. Section 03 30 00 "Cast-in-Place Concrete" for moisture curing of concrete waterproofing substrate.
3. Section 07 21 00 "Thermal Insulation" for foundation insulation.
4. Division 07 air barrier section for wall waterproofing and interface coordination.

1.3 SUBMITTALS

- A. Product Data: For each type of waterproofing product (and expansion joint accessory if applicable) specified, including:
1. Technical data indicating compliance with requirements.
 2. Substrate preparation instructions and recommendations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A manufacturer-approved firm with minimum three years experience in installation of specified products in successful use on similar projects.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Accept materials on site in manufacturer's unopened original packaging.
- B. Store products in weather protected environment, clear of ground and moisture, within temperature ranges recommended by waterproofing manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.
1. Protect substrates from environmental conditions that affect waterproofing performance.
 2. Do not apply waterproofing during snow, rain, fog, or mist.

1.7 WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which waterproofing manufacturer agrees to furnish waterproofing material to repair or replace those materials installed according to manufacturer's written instructions that exhibit material defects or otherwise fail to perform as specified under normal use within warranty period specified.
1. Access for Repair: Owner shall provide unimpeded access to the Project and the waterproofing system for purposes of testing, leak investigation, and repair, and shall reinstall removed cladding and overburden materials upon completion of repair.
 2. Cost Limitation: Manufacturer's obligation for repair or replacement shall be limited to the original installed cost of the work.
 3. Warranty Period: 10 years date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
1. Carlisle Coatings & Waterproofing Inc.
 2. MAPEI Corporation.
 3. Tremco, Inc. – Basis-of-Design.
 4. Approved equal.

1 **2.2 PERFORMANCE REQUIREMENTS**

- 2 A. General: Waterproofing system shall be capable of performing as a continuous watertight installation and as a
3 moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior.
4 Waterproofing shall accommodate normal substrate movement and seal expansion and control joints, construction
5 material transitions, opening transitions, penetrations, and perimeter conditions without resultant moisture
6 deterioration.
- 7 B. Compatibility: Provide waterproofing system materials that are compatible with one another and with adjacent
8 materials under conditions of service and application required, as demonstrated by waterproofing manufacturer
9 based on testing and field experience.
- 10 C. ASTM E7877 (Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes,
11 low-voltage)
- 12 1. Test Schedule: At 10% TPO membrane installation completion, after membrane adhered, joints
13 taped/waterproofed, and manufacturer's required curing time has elapsed, before installation of exterior
14 continuous insulation.
 - 15 2. Test Quantity: 2 tests, as directed by Owner, BCxP, and Architect.
 - 16 3. Pass Criteria: No leaks detected.

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18 **2.3 WATERPROOFING MEMBRANE**

- 19 A. Cold Fluid-Applied Waterproofing: polymer-enhanced, single component, fluid-applied, asphalt emulsion, below-
20 grade waterproofing membrane.
- 21 1. Basis of Design Product: Tremco, Inc., TREMproof 260.
 - 22 2. VOC Content: No more than 72 g/L.
 - 23 3. Hardness, ASTM D 2240: 50 minimum; Pass.
 - 24 4. Low Temperature Crack Bridging, ASTM C836; Modified ASTM C1305: Pass.
 - 25 5. Adhesion-in-Peel after Water Immersion, ASTM C836; ASTM C794: Exceeds.
 - 26 6. Elongation, ASTM D412: 800%.
 - 27 7. Peel adhesion, ASTM D903: Passes.
 - 28 8. Low-Temp Flexibility, ASTM C836: Pass.
 - 29 9. Water resistance, ASTM C836, AATC-127: Pass.
 - 30 10. Water Vapor Permeance E96 Dry Cup: 0.028 US Perms.
 - 31 11. Water Vapor Permeance E96 Wet Cup: 0.032 US Perms.
 - 32 12. Stability (80°F/26.7°C): 6 months Minimum 1 year.
 - 33 13. Solids 64%, Density 8.1 lb/gal.

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35 **2.4 ACCESSORY MATERIALS**

- 36 A. General: Accessory materials as described in manufacturer's written installation instructions, recommended to
37 produce complete waterproofing system meeting performance requirements, and compatible with waterproofing
38 material and adjacent materials.
- 39 B. Elastomeric Detail Sheet: Blended thermoset elastomeric sheet reinforced with polyester woven scrim.
- 40 1. Basis of Design Product: Tremco, TRA Elastomeric Sheeting.
- 41 C. Elastomeric transition flashing to above-grade: polyurethane liquid-applied coating system with ultraviolet protective
42 topcoat.
- 43
 - 44 1. Basis of Design Product: Vulkem 350/351; Tremco Inc.
 - 45 2. Basis of Design Product: Vulkem 801; Tremco Inc.
- 46 D. Metal Termination Bars: Waterproofing manufacturer's standard aluminum or stainless steel termination bar, with
47 stainless steel fasteners.
- 48 E. Joint Sealant: ASTM C 719, high performance, medium-modulus, low-VOC, UV-stable, non-sag polyurethane sealant
49 approved by waterproofing manufacturer for adhesion and compatibility with waterproofing and accessories.
- 50 1. Basis of Design Product: Tremco, Dymonic 100.
- 51 F. Expansion Joint Pre-compressed or Closed Cell, Monolithic Foam System. Foam Structure Must not Contain
52 Unbonded Foam Laminations:
- 53 1. Willseal® Coreseal for use in both vertical and horizontal below grade system applications requiring +/-25%
54 movement capability, closed cell, and a lightweight seal.
 - 55 2. Willseal® 250 BG for use in below grade applications, requiring +/- 50% movement capability.

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57 **2.5 INSULATION**

- 58 A. Insulation, General: Comply with Section 07 2100 "Thermal Insulation."

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Surface Condition: Before applying waterproofing materials and accessories, examine substrate and conditions to ensure substrates are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion, and conditions comply with manufacturer's written recommendations.
 - 1. Verify concrete and masonry surfaces are free from release agents, curing agents, laitance, and other contaminants. Test for waterproofing adhesion per manufacturer's recommended method. Notify Architect of unsatisfactory conditions.
 - 2. Verify masonry joints are filled with mortar and struck flush.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INTERFACE WITH OTHER WORK

- A. Sequencing of Work: Coordinate sequencing of waterproofing work with work of other sections that form portions of building envelope moisture control to ensure that expansion joints, flashings and transition materials can be properly installed and inspected.
- B. Subsequent Work: Coordinate waterproofing work with work of other sections installed subsequent to waterproofing to ensure complete inspection of installed waterproofing and sealing of waterproofing penetrations necessitated by subsequent work.

3.3 PREPARATION

- A. Clean, prepare, and treat substrates in accordance with waterproofing manufacturer's written instructions.
 - 1. Mask adjacent finished surfaces.
 - 2. Remove contaminants and film-forming coatings from substrates.
 - 3. Remove projections and excess materials and fill voids with substrate patching material.
 - 4. Prepare and treat joints and cracks in substrate per ASTM D 4258 and waterproofing manufacturer's written instructions.
 - 5. For accessory materials, follow manufacturers application instructions.
- B. Detail Preparation: Prepare non-moving shrinkage cracks, large cracks, construction joints, expansion joints, projections and protrusions, penetrations, drains, and changes in plane in accordance with waterproofing manufacturer's written instructions and details, using accessory materials specified. The following are two acceptable options for detail preparation:
 - 1. Adhere strips of elastomeric sheet to moving expansion joints on both sides in conjunction with a metal termination bar embedded in a layer of cold fluid-applied waterproofing and overlay with coat of cold fluid-applied waterproofing.
 - 2. Apply single-component urethane within moving expansion joints and overlay with a coat of cold fluid-applied waterproofing.
- C. Transitions to Adjacent Materials: Apply Tremco Approved Primer to transition cold fluid-applied waterproofing membrane to adjacent components of the building envelope.

3.4 WATERPROOFING INSTALLATION

- A. General: Apply waterproofing material to form a seal to achieve a continuous waterproofing according to waterproofing manufacturer's written instructions. Apply waterproofing material within manufacturer's recommended application temperature ranges.
- B. Cold Fluid-Applied Waterproofing: Apply waterproofing in total wet film thickness and with methods recommended in writing by waterproofing manufacturer.
- C. Terminations: Install terminations of waterproofing membrane in accordance with ASTM C 898 Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Separate Wearing Course and ASTM C 1471 Standard Guide for Use of High Solids Content Cold Liquid-Applied Elastomeric Waterproofing Membrane on Vertical Surfaces, as applicable to application, at not less than minimum height recommended by waterproofing manufacturer.
- D. Coordination of Testing:
 - 1. Do not cover waterproofing until it has been tested and inspected by Owner's testing agency.
- E. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates and reapply waterproofing components.

- 1 **3.5 FIELD QUALITY CONTROL**
- 2 A. Contractor's Inspector: Contractor shall engage manufacturer's qualified Inspector full-time during the Work to
- 3 perform tests and inspections, including documenting of waterproofing prior to concealment.
- 4 1. Contractor's Inspector shall measure membrane thickness with a wet film gauge during the application
- 5 process at least once for every 100 sq. ft. (10 sq. m).
- 6 2. Provide written report of tests and inspections.
- 7 3. Where applicable, inspect transitional material such as expansion joints, flashings, insulation are installed per
- 8 manufacturers recommendations.
- 9 B. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, waterproofing
- 10 application, protection, and drainage components, and to furnish reports to Architect.
- 11 C. Coordination of Inspection: Cooperate with testing agency. Allow access to work areas and staging. Notify testing
- 12 agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection.
- 13 1. Do not cover Work until testing and inspection is completed and accepted.
- 14 D. Reporting: Forward written inspection reports to the Architect within 10 working days of the inspection and test
- 15 being performed.
- 16 E. Correction of Work: Correct deficient applications not passing tests and inspections, make necessary repairs, and
- 17 retest as required to demonstrate compliance with requirements.
- 18
- 19 **3.6 CLEANING AND PROTECTING**
- 20 A. Clean spills, stains, and overspray resulting from application utilizing cleaning agents recommended by manufacturers
- 21 of affected construction. Remove masking materials.
- 22 B. Protect waterproofing from damage from subsequent work. Protect waterproofing materials from exposure to UV
- 23 light for period in excess of that acceptable to waterproofing manufacturer; replace overexposed materials and
- 24 retest.
- 25
- 26

END OF SECTION

- 1 a. Dow Chemical Company – Styrofoam Grey.
- 2 b. Owens Corning – Foamular NGX.
- 3 c. Soprema – Sopra XPS.
- 4 d. Or approved equal.
- 5 B. Foundation Extruded Polystyrene (XPS) Board Insulation: ASTM C 578, Type IV, with maximum smoke-developed
- 6 indexes of 10 and 175, respectively.
- 7 1. Manufacturers:
- 8 a. Dupont – Styrofoam.
- 9 b. Kingspan – GreenGuard.
- 10 c. Owens Corning – Foamular 250.
- 11 d. Or approved equal.
- 12

13 **2.3 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION**

- 14 A. Polyisocyanurate Board Insulation, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.
- 15 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 16 a. Atlas Polyiso Roof and Wall Insulation.
- 17 b. Carlisle Coatings & Waterproofing Inc.
- 18 c. Dow Chemical Corporation.
- 19 d. Rmax, A Business Unit of Sika Corporation.
- 20 e. Or approved equal.
- 21

22 **2.4 MINERAL-WOOL BLANKET INSULATION**

- 23 A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I; consisting of fibers passing ASTM E136 for
- 24 combustion characteristics.
- 25 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 26 a. Johns Manville.
- 27 b. Owens Corning.
- 28 c. ROCKWOOL.
- 29 d. Or approved equal.
- 30

31 **2.5 FOAMED-IN-PLACE INSULATION**

- 32 A. Closed-Cell Polyurethane Foam, ASTM C1029, Type II.
- 33 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 34 a. Carlisle – SealTite PRO Closed Cell.
- 35 b. CertainTeed Corporation – CertaSpray CC.
- 36 c. Henry Company Permax 2.0.
- 37 d. Or approved equal.
- 38

39 **2.6 INSULATION FASTENERS**

- 40 A. Insulation Fastener Accessories: Provide double-pointed weld pins, lagging pins, quilting pins, duct liner pins,
- 41 insulation hangers, specialty washers, special caps, j-hooks, capacitor discharge annular weld pins, capacitor
- 42 discharge acoustical lagging pins, and other accessory materials that are recommended in writing by insulation
- 43 fastener manufacturer to produce complete insulation supports.
- 44

45 **2.7 ACCESSORIES**

- 46 A. Insulation for Miscellaneous Voids:
- 47 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed
- 48 indexes of 5, per ASTM E84.
- 49 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and

1 smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

2 B. Miscellaneous Application Accessories:

- 3 1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials,
4 and with demonstrated capability to bond insulation securely to substrates without damaging insulation
5 and substrates.
6 2. Crack Sealer: Closed-cell insulating foam in aerosol dispenser recommended in writing by insulation
7 manufacturer for filling gaps in board insulation.
8 3. Detailing Foam Insulation for Voids: Urethane foam complying with AAMA 812, low expansion pressure
9 suitable for filling insulation gaps and voids adjacent to openings to protect against water, air, and sound
10 intrusion.
11 4. Tapes for Reflective Insulation and Barriers:
- 12 a. Aluminum-foil tape for repairs or splicing material.
 - 13 b. Double-sided tape for adhering to metal framing or overlapping material.
 - 14 c. Reinforced-foil tape for sealing tears or cuts in sheet vapor barrier.
- 15

16 **PART 3 - EXECUTION**

17 **3.1 PREPARATION**

- 18 A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing
19 insulation or vapor retarders, or those that interfere with insulation attachment.
- 20

21 **3.2 INSTALLATION, GENERAL**

- 22 A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable
23 codes.
24 B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at
25 any time.
26 C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
27 D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation.
28 Remove projections that interfere with placement.
29 E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply
30 single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or
31 to achieve R-value.
- 32

33 **3.3 INSTALLATION OF SLAB INSULATION**

- 34 A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive in
35 accordance with manufacturer's written instructions.
36 B. On horizontal surfaces, loosely lay insulation units in accordance with manufacturer's written instructions. Stagger
37 end joints and tightly abut insulation units.
- 38

39 **3.4 INSTALLATION OF FOUNDATION WALL INSULATION**

- 40 A. Butt panels together for tight fit.
41 B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation
42 anchors as follows:
- 43 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive in accordance with anchor
44 manufacturer's written instructions.
 - 45 2. Space anchors in accordance with insulation manufacturer's written instructions for insulation type,
46 thickness, and application.
 - 47 3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete
48 substrate and insulation.

- 1 4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and
- 2 securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
- 3 5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- 4 C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing in accordance with
- 5 manufacturer's written instructions.

6

7 **3.5 INSTALLATION OF CAVITY-WALL INSULATION**

- 8 A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face
- 9 and as recommended in writing by manufacturer.
- 10 1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both
- 11 directions, and with faces flush.
- 12 2. Press units firmly against inside substrates.
- 13 3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this
- 14 purpose and specified in Section 042000 "Unit Masonry."

15

16 **3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION**

- 17 A. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in
- 18 insulation using the following materials:
- 19 1. Mineral-Wool Insulation: Compact to approximately 40 percent of normal maximum volume equaling a
- 20 density of approximately 2.5 lb/cu. ft..
- 21 2. Detailing Foam Insulation for Voids: Apply in accordance with manufacturer's written instructions.
- 22 B. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation in accordance with manufacturer's written
- 23 instructions.
- 24 1. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is
- 25 completed and windows, electrical boxes, and other items not indicated to receive insulation are masked.
- 26 2. After insulation is applied, make flush with face of studs by using method recommended by insulation
- 27 manufacturer.

28

29 **3.7 INSTALLATION OF BOARD INSULATION**

- 30 A. Install board insulation in accordance with manufacturer's written instructions per project applications and
- 31 conditions.

32

33 **3.8 PROTECTION**

- 34 A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- 35 B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and
- 36 protected by permanent construction immediately after installation.

37

38

END OF SECTION

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Low-build air barriers, vapor permeable.
- B. Related Requirements:
 - 1. Section 01 43 50 "Air Barrier Systems" for administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air.
 - 2. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.
 - 3. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.2 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- B. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- C. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to set quality standards for materials and execution.
 - 1. Build integrated mockups of exterior wall assembly , 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1 **1.6 FIELD CONDITIONS**

- 2 A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures
3 recommended in writing by air-barrier manufacturer.
4 1. Protect substrates from environmental conditions that affect air-barrier performance.
5 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

6 **PART 2 - PRODUCTS**

7 **2.1 SOURCE LIMITATIONS**

- 8 A. Obtain primary air-barrier materials and air-barrier accessories from single manufacturer.

9 **2.2 PERFORMANCE REQUIREMENTS**

- 10 A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to be capable of
11 performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the
12 exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of
13 accommodating substrate movement and of sealing substrate expansion and control joints, construction
14 material changes, penetrations, and transitions at perimeter conditions without deterioration and air
15 leakage exceeding specified limits.
16 B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested
17 in accordance with ASTM E2357.
18 C. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. pressure difference; ASTM
19 E2178.
20 D. Ultimate Elongation: Minimum 350 percent; ASTM D412, Die C.
21 E. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
22 F. ASTM E 1186-03, (Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier
23 System.) Section 4.2.7 (Chamber Depressurization in Conjunction with Leak Detection Liquid.)

24 **2.3 LOW-BUILD AIR BARRIERS, VAPOR PERMEABLE**

- 25 A. Low-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness,
26 according to manufacturer's written instructions, of 6 to 15 mils over smooth, void-free substrates.
27 1. Basis-of-Design Product: Subject to compliance with requirements, provide W. R. Meadows, Inc: Air-
28 Shield TMP or comparable product by one of the following:
29 a. Dryvit, part of Tremco CPG
30 b. Master Wall Inc.
31 c. Pecora Corporation
32 d. PROSOCO, Inc
33 2. Vapor Permeance: Minimum 10 perms; ASTM E96/E96M, Procedure A, Desiccant Method.

34 **2.4 ACCESSORY MATERIALS**

- 35 A. Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants,
36 counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching
37 materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are
38 recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that
39 are compatible with primary air-barrier material and adjacent construction to which they may seal.
40 B. Primer: Liquid solvent-borne primer recommended for substrate by air-barrier material manufacturer.

41 **PART 3 - EXECUTION**

42 **3.1 EXAMINATION**

- 43 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and
44 other conditions affecting performance of the Work.

- 1 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
- 2 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-
- 3 barrier manufacturer.
- 4 3. Verify that substrates are visibly dry and free of moisture.
- 5 B. Proceed with installation only after unsatisfactory conditions have been corrected.

6 **3.2 SURFACE PREPARATION**

- 7 A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate in accordance with
- 8 manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier
- 9 application.
- 10 B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other
- 11 construction.
- 12 C. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to
- 13 form a smooth transition from one plane to another.
- 14 D. Bridge isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck
- 15 joints with air-barrier accessory material that accommodates joint movement in accordance with
- 16 manufacturer's written instructions and details.

17 **3.3 INSTALLATION OF ACCESSORIES**

- 18 A. Install accessory materials in accordance with air-barrier manufacturer's written instructions and details to
- 19 form a seal with adjacent construction and ensure continuity of air and water barrier.
- 20 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to
- 21 ensure continuity of air barrier with roofing membrane.
- 22 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of
- 23 coverage is achieved over each substrate.
- 24 3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required
- 25 rate and allow it to dry.
- 26 4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be
- 27 covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- 28 B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete
- 29 below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-
- 30 wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in
- 31 exterior wall openings, using accessory materials.
- 32 C. At end of each working day, seal top edge of strips and transition strips to substrate with termination
- 33 mastic.
- 34 D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application
- 35 temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature
- 36 ranges.
- 37 E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and
- 38 doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate.
- 39 Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full
- 40 contact.
- 41 1. Transition Strip: Roll firmly to enhance adhesion.
- 42 F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous
- 43 penetrations of air-barrier material with foam sealant.
- 44 G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination
- 45 mastic.
- 46 H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.
- 47 I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal
- 48 counterflashings or ending in reglets with termination mastic.
- 49 J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten
- 50 fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip
- 51 direction.

1 **3.4 INSTALLATION OF PRIMARY AIR-BARRIER MATERIAL**

- 2 A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air
3 barrier in accordance with air-barrier manufacturer's written instructions and details. Apply air-barrier
4 material within manufacturer's recommended application temperature ranges.
- 5 1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required
6 rate and allow it to dry.
- 7 2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas
8 exposed for more than 24 hours.
- 9 3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time
10 between coats.
- 11 B. Low-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the
12 following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions
13 such as masonry ties.
- 14 1. Vapor-Permeable, Low-Build Air Barrier: Total dry film thickness as recommended in writing by
15 manufacturer to comply with performance requirements, applied in one or more equal coats. Apply
16 additional material as needed to achieve void- and pinhole-free surface, but do not exceed
17 thickness on which required vapor permeability is based.
- 18 C. Do not cover air barrier until it has been tested and inspected by testing agency.
- 19 D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and
20 reapply air-barrier components.

21 **3.5 FIELD QUALITY CONTROL**

- 22 A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- 23 B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with
24 requirements. Inspections may include the following:
- 25 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps
26 or holes.
- 27 2. Air-barrier dry film thickness.
- 28 3. Continuous structural support of air-barrier system has been provided.
- 29 4. Site conditions for application temperature and dryness of substrates have been maintained.
- 30 5. Maximum exposure time of materials to UV deterioration has not been exceeded.
- 31 6. Surfaces have been primed, if applicable.
- 32 7. Laps in strips and transition strips have complied with minimum requirements and have been
33 shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
- 34 8. Termination mastic has been applied on cut edges.
- 35 9. Strips and transition strips have been firmly adhered to substrate.
- 36 10. Compatible materials have been used.
- 37 11. Transitions at changes in direction and structural support at gaps have been provided.
- 38 12. Connections between assemblies (air-barrier and sealants) have complied with requirements for
39 cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
- 40 13. All penetrations have been sealed.
- 41 C. Tests: As determined by testing agency from among the following tests and as outlined in Section 01 43 50
42 "Air Barrier Systems":
- 43 1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage in
44 accordance with ASTM E1186, chamber pressurization or depressurization with smoke tracers. One
45 set of 25 bubble tests shall be performed. Perform corrective measures as needed up to and
46 including another coat with another set of 25 bubble tests.
- 47 2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate in
48 accordance with ASTM D4541 for each 600 sq. ft. of installed air barrier or part thereof and at
49 minimum three building façade locations.
- 50 D. Air barriers will be considered defective if they do not pass tests and inspections.
- 51 1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where
52 inspection results indicate insufficient thickness.
- 53 2. Remove and replace deficient air-barrier components for retesting as specified above.
- 54 E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.
- 55 F. Prepare test and inspection reports.

- 1 **3.6 CLEANING AND PROTECTION**
2 A. Protect air-barrier system from damage during application and remainder of construction period, in
3 accordance with manufacturer's written instructions.
4 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in
5 writing by manufacturer. If exposed to these conditions for longer than recommended, remove and
6 replace air barrier or install additional, full-thickness, air-barrier application after repairing and
7 preparing the overexposed materials in accordance with air-barrier manufacturer's written
8 instructions.
9 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-
10 barrier manufacturer.
11 B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using
12 cleaning agents and procedures recommended in writing by manufacturer of affected construction.
13 C. Remove masking materials after installation.

14 END OF SECTION

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SECTION 074213.23
METAL COMPOSITE MATERIAL WALL PANELS

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PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal composite wall panels.
 - 2. Cladding system.
- B. Related Sections:
 - 1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination Procedures:
 - 1. Coordinate metal composite panel installation with completion of air barrier and sheathing.
- B. Preinstallation Meeting Attendees and Procedures:
 - 1. Conduct meeting one week, minimum, before starting Work of this Section.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Panel materials.
 - 2. Support girt system components.
 - 3. Initial selection color samples.
- B. Shop Drawings: Detail the following:
 - 1. Fabrication and installation layouts.
 - 2. Edge conditions at openings and corners.
 - 3. Penetrations.
 - 4. Flashing, trim and anchorage.
 - 5. Weep locations.
- C. Sustainable Design Submittals:
 - 1. Building Product Disclosure and Optimization: Sourcing of raw materials and recycled content documentation for steel.

1.4 INFORMATIONAL SUBMITTALS

- A. Delegated Design Submittals:
 - 1. Installation system design including support girt system and anchorage to substrate.
- B. Field Quality Control Submittals: Field test and inspection reports.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty Documentation.

1.6 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Fabricator and Installer: An entity that employs installers and supervisors who are trained and approved by MCM Fabricator.
 - 2. Licensed Professionals: Licensed in the State of Wisconsin.
- B. Preconstruction Testing: Test each product. Complete testing 30 days, minimum, before scheduled field installation.
 - 1. Water Leakage: AAMA 501.2 water spray test.
- C. First-in-Place Mockup: Provide 25 sf of material mockup in place. Include as many corner, head, jamb, and sill conditions as reasonably possible.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

- 1 **1.7 DELIVERY, STORAGE, AND HANDLING**
2 A. Storage and Handling Requirements:
3 1. Handle metal composite material panels to prevent soiling and damage, including bending, warping,
4 twisting, and marring of surfaces.
- 5 **1.8 FIELD CONDITIONS**
6 A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit
7 assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty
8 requirements.
9 B. Existing Conditions: Verify field measurements before fabrication. Show field measurements on Shop Drawings.
- 10 **1.9 WARRANTY**
11 A. Manufacturer Warranty:
12 1. Warrant against product failure.
13 a. Failure includes panel rupturing, cracking or puncturing, and deterioration of metal.
14 b. Warranty Period: Two years.
15 B. Finish Warranty: Repair deteriorated finishes or replace components.
16 1. Deterioration includes the following:
17 a. Color Fading: More than 5 Hunter units per ASTM D2244.
18 b. Chalking: More than No. 8 rating per ASTM D4214.
19 c. Paint cracking, peeling or checking.
20 2. Warranty Period: 20 years.

21 **PART 2 PRODUCTS**

- 22 **2.1 METAL COMPOSITE MATERIAL WALL PANELS**
23 A. Aluminum-Faced Composite Wall Panels: Two aluminum facings bonded to solid plastic core.
24 1. Manufacturers and Products:
25 a. Alpolic.
26 b. Alucobond USA.
27 c. Arconic Architectural Products.
28 d. Or approved equal.
29 2. Face Texture: Smooth.
30 3. Color: See Drawings.
- 31 **2.2 CLADDING SYSTEM**
32 A. Support Girt System: Thermally broken:
33 1. Manufacturers and Products:
34 a. Armatherm-Z-Girt.
35 b. Cladiator SLOTTED-Z.
36 c. SMARTci GREENGirt Clip.
37 d. SFS Intec NVELOPE NV1.
38 e. Or approved equal.
39 2. Depth: See Drawings.
40 3. Fasteners: Corrosion resistant screws for anchorage to substrate.
41 B. Flashing and Trim: Same metal and finish as MCM face sheet.
42 C. Other System Components:
43 1. Panel Fasteners: Concealed, non-corroding, self-tapping screws designed to withstand design loads.
44 2. Dry Sealed Joints: Installation system manufacturers standard gaskets.
45 a. Colors: Architect selected.
46 b. Locations: As shown on Drawings.
47 3. Wet Sealed Joints: Nonsag, nonstaining silicone or one part urethane sealant specified in Section 079200.
48 a. Colors: Match MCM panels.
49 b. Locations: As shown on Drawings.
50 4. Coping Splice Plate Sealant: ASTM C1311, butyl rubber sealant (non-skimming); of type, grade, class, and
51 use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- 1 **2.3 PERFORMANCE**
- 2 A. Structural Loads:
- 3 1. Wind Load: As indicated on Drawings.
- 4 B. Roof Edge Securement: MCM used as coping or roof edge trim.
- 5 1. Design assembly to resist wind loads.
- 6 2. Pass ANSI SPRI ES-1 testing.
- 7 C. Allowable Deflection: For wind loads, panel deflection no greater than L/60 of the span.
- 8 D. Fire Performance:
- 9 1. Surface Burning: 25, maximum per ASTM E84.
- 10 2. Smoke Developed Index: 450, maximum per ASTM E84.
- 11 3. Fire Rated Wall Assemblies: Testing agency listed assembly requirements.
- 12 4. Exterior Wall Testing: Wall assembly tested per NFPA 285.
- 13 E. Environmental Performance:
- 14 1. Expansion and Contraction: Withstand thermal cycling over 120 degrees F ambient and 180 degrees F on
- 15 material surfaces.
- 16 F. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. of wall area when tested in accordance with ASTM
- 17 E283 at the following test-pressure difference:
- 18 1. Test Pressure Difference: 6.24 lbf/sq. ft.
- 19 G. Water Penetration under Static Pressure: No water penetration to room side of assembly when tested for 15
- 20 minutes in accordance with ASTM E331 at the following test-pressure difference:
- 21 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- 22 H. AAMA 501.2 (Quality Assurance and Diagnostic Water Leakage Field Check).
- 23

- 24 **2.4 FABRICATION**
- 25 A. Shop Fabrication: Form panel returns and profiles in shop.
- 26 B. Where needed to minimize oil canning and deflection from wind loads, provide stiffening angles on concealed
- 27 side.
- 28 C. Fabricate panels with consistent grain direction shown on Shop Drawings.
- 29 D. Form sections to shapes shown on Drawings, accurate in size, square, and free from distortion or defects.
- 30 E. Form pieces in longest practicable lengths.
- 31 F. Sheet Metal Flashing and Trim:
- 32 1. Form from material thick enough to prevent oil canning and buckling. Hem exposed edges.
- 33 2. Seams: Lapped and elastomeric or silicone sealed per SMACNA standards.
- 34 3. Exposed Fasteners: Not permitted.

- 35 **2.5 ALUMINUM FINISHES**
- 36 A. Color Coating: Two coat fluoropolymer finish with minimum 70 percent PVDF resin by weight in color; AAMA
- 37 2605.
- 38 1. Color and Gloss: See Drawings.

39 **PART 3 EXECUTION**

- 40 **3.1 EXAMINATION**
- 41 A. Verification of Conditions:
- 42 1. Verify substrate installation and air barrier application is complete per Section 07 25 00.
- 43 2. Verify framing members are ready to receive panel systems.
- 44 3. Verify penetrating items are ready for cladding system installation.

- 45 **3.2 PREPARATION**
- 46 A. Support Girt System: Install in orientation, sizes, and locations shown on Shop Drawings. Coordinate with
- 47 continuous insulation.

- 48 **3.3 INSTALLATION**
- 49 A. Fasten panel support assembly to girt system.

- 1 B. Install panels in locations, spacings, and orientation shown on Drawings. Anchor panels securely.
- 2 1. Wet Sealed Systems: Apply backer rod and sealant between adjacent panels per Section 079200. Seal
- 3 corners watertight.
- 4 2. Dry Sealed Systems: Apply manufacturer provided gaskets between adjacent panels.
- 5 C. Accommodate thermal and structural movement without failure.
- 6 D. Erection Tolerances:
- 7 1. Offset Between Adjacent Members: 1/16 inch, maximum.
- 8 2. Variation from Plane or Location: 1/8 inch in 20 feet, maximum, non-cumulative.

9 **3.4 FIELD QUALITY CONTROL**

- 10 A. Field Tests and Inspections: Engage inspectors to perform tests and inspections and prepare reports. Allow
- 11 inspectors access to Work areas.
- 12 1. Retesting of Failed Tests: Performed at Contractor expense.
- 13 2. Do not begin construction until inspectors have verified compliance of materials.
- 14 3. Do not use materials that fail tests and inspections.
- 15 B. Water Spray Test: AAMA 501.2.
- 16 1. Test Schedule: At 10% and 50% installation completion, prior to installation of interior finishes, performing
- 17 out of sequence work is required to facilitate testing schedule.
- 18 2. Test Quantity: 200' linear per round (up to 400' total), as directed by Owner, BCxP, and Architect.
- 19 3. Pass Criteria: No visible water intrusion.
- 20 C. Non-Conforming Work: Remove and replace and retest.

21 **3.5 CLEANING**

- 22 A. Remove site cuttings from finish surfaces.
- 23 B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.
- 24 C. Clear weep holes and drainage channels.

25 **END OF SECTION 07 42 13.23**

26

**SECTION 07 46 19
PREFORMED STEEL SIDING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes metal siding.

1.2 DESIGN

- A. Siding shall be designed to withstand positive wind load of 1kPPa and negative load of 0.6 kPa at a maximum allowable deflection of 1/180 of span between attachments.
- B. Indicate test data supporting the above requirements on shop drawing submission.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim, and closure pieces, and related work.
- C. Samples for verification.
- D. Sustainable Design Submittals:
 - 1. Building Product Disclosure and Optimization: Sourcing of raw materials and recycled content documentation for steel.

1.4 QUALITY ASSURANCE

- A. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- B. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- C. Manufacturer: All products and components from same manufacturer.
- D. First-in-Place Mockup: Provide 25 sf of material mockup in place. Include as many corner, head, jamb, and sill conditions as reasonably possible.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in accordance with manufacturer's written instructions.
- B. Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- C. Storage and Handling Requirements:
 - 1. Store materials off ground, in dry location, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.
 - 2. Stack panel sheets tilted to provide water run-off.
 - 3. Store and protect siding from nicks, scratches, and blemishes.
 - 4. Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide LUX wall panels by LUX Architectural Products Inc., or comparable product by one of the following:
 - 1. Bellara.
 - 2. Longboard.
 - 3. Or approved equal.

2.2 FINISHES

- A. Finish: Prefinished, coil coated. 1.0 mil fluoropolymer (PVDF).
- B. Color: As selected by Architect from manufacturer's standard colors.

**SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING**

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) membrane roofing system.
2. Mechanically fastened TPO membrane roofing system (if cold weather installation).
3. Roof Insulation.
4. Vapor retarder.
5. Substrate boards.
6. Walkway pads.
7. Roofing system accessories necessary for installation of complete system (e.g. cant strips, stack boots, roofing expansion joints).

A. Related Sections:

1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.

1.2 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 99 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.
- B. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- C. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.79 (SRI Index 99) and an aged solar reflectance not less than 0.70 (SRI Index 85) and emissivity not less than 0.90 when tested according to CRRC-1.
- D. ASTM E 1186-03, (Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier System.) Section 4.2.7 (Chamber Depressurization in Conjunction with Leak Detection Liquid.).
- E. ASTM E7877 (Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes, low-voltage).
- F. ASTM D 8231 – 19, (Standard Practice for the Use of a Low Voltage Electronic Scanning System for Detecting and Locating Breaches in Roofing and Waterproofing Membranes)

1.3 SUBMITTALS

- A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.
- B. Specimen Warranty: For approval.
- C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, joint or termination detail conditions, conditions of interface with other materials, attachments to other work, and paver layout.
- D. Samples for Verification: Sheet roofing, of color specified.
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 1. Submit evidence of compliance with performance requirements.
- F. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.
- G. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.
- H. Research/evaluation reports.
- I. Sustainable Design Submittals:
 1. Product Test Reports: For roof material, documentation indicating that roof materials comply with Solar Reflectance Index requirements.
- J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- K. Maintenance data.

1 **1.4 QUALITY ASSURANCE**

- 2 A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with
- 3 minimum 10 years of documented experience.
- 4 B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system
- 5 manufacturer to install manufacturer's product.
- 6 C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from
- 7 same manufacturer as membrane roofing manufacturer or components approved by membrane roofing
- 8 manufacturer.
- 9 D. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing
- 10 identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate
- 11 markings of applicable testing agency.
- 12 E. Preinstallation Roofing Conference: Conduct conference at Project site.

13
14 **1.5 WARRANTY**

- 15 A. System Warranty: Provide manufacturer's system warranty, without monetary limitation, in which manufacturer
- 16 agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within
- 17 specified warranty period.
- 18 1. Warranty Period: 20 years from date of Substantial Completion.

19
20 **1.6 DELIVERY, STORAGE, AND PROTECTION**

- 21 A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- 22 B. Store products in weather protected environment, clear of ground and moisture.

23
24 **PART 2 - PRODUCTS**

25
26 **2.1 MANUFACTURERS**

- 27 A. Thermoplastic Polyolefin Membrane Materials:
- 28 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 29 a. Carlisle SynTec Incorporated.
- 30 b. Firestone Building Products Company.
- 31 c. GenFlex Roofing Systems.
- 32 d. Versico VersiWeld Reinforced TPO Membrane.
- 33 e. Or approved equal.

34
35 **2.2 ROOFING MEMBRANE AND ASSOCIATED MATERIALS**

- 36 A. Membrane:
- 37
- 38 1. Material: Thermoplastic polyolefin (TPO) complying with ASTM D 6878.
- 39 2. Reinforcing: Internal fabric.
- 40 3. Thickness: .060 inch, minimum.
- 41 4. Sheet Width: Factory fabricated into largest sheets possible.
- 42 5. Color: White.
- 43 6. SRI Index: Initial 99 Aged 85.
- 44 B. Seaming Materials: As recommended by membrane manufacturer.
- 45 C. Membrane Fasteners: As recommended by membrane manufacturer.
- 46 D. Vapor Retarder: Reinforced Kraft paper laminate complying with requirements of fire rating classification; compatible
- 47 with roofing and insulation materials.
- 48 E. Flexible Flashing Material: Same material as membrane.
- 49 F. Separation Sheet: Sheet polyethylene; 2 mil thick.
- 50 G. Substrate Board: ASTM C 1177.C 1177M, glass-mat, water-resistant gypsum substrate, fire resistant type.
- 51
- 52 1. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance
- 53 provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.
- 54 H. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof
- 55 membrane.
- 56 1. Configuration: Roll
- 57 2. Products:
- 58 a. Sure-Weld TPO, by Carlisle.

- 1 b. UltraPly TPO Walkway Pad, by Firestone.
- 2 c. Approved equal.
- 3

4 **2.3 INSULATION**

- 5 A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, with maximum flame-spread and smoke-
6 developed indexes of 75 and 450 respectively, based on tests performed on unfaced core on thicknesses up to 4
7 inches.
 - 8 1. Manufacturers:
 - 9 a. Atlas Roofing Corporation.
 - 10 b. Dow Chemical Corporation.
 - 11 c. Rmax, Inc.
 - 12 d. Versico Roofing Systems.
 - 13 e. Approved Equal.
 - 14 2. R-Value: See Drawings.
- 15 B. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to
16 drain. Fabricate to slopes indicated.
- 17

18 **2.4 INSULATION ACCESSORIES**

- 19 A. General: All accessory items that compose any material or component portion of the roofing system and are
20 materially inherent to its successful installation and performance of the roofing system for the length of its designed
21 life, and directly affect the guarantees provided by the roofing system manufacturer, the roofing system installer, the
22 warranties and the extent of their coverage, shall only be materials and products that are recommended, required,
23 and/or otherwise approved in writing by the roofing manufacturer and the installing roofing system contractor.
- 24 B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- 25 C. Insulation Joint Tape: Glass fiber reinforced type as recommended by insulation manufacturer, compatible with
26 roofing materials; 6 inches wide; self-adhering.
- 27 D. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof
28 insulation to substrate or to another insulation layer.
- 29 E. Membrane Adhesive: As recommended by membrane manufacturer.
- 30

31 **PART 3 - EXECUTION**

32

33 **3.1 EXAMINATION**

- 34 A. Verify that surfaces and site conditions are ready to receive work.
- 35 B. Verify that deck is supported and secure.
- 36 C. Verify that deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for
37 installation of roofing system.
- 38 D. Verify that deck surfaces are dry and free of snow or ice.
- 39 E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.
- 40

41 **3.2 INSTALLATION – GENERAL**

- 42 A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.
- 43 B. Do not apply roofing membrane during unsuitable weather.
- 44 C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by
45 manufacturer.
- 46 D. Do not install roofing membrane over damp or frozen deck surface or when precipitation is expected or occurring.
- 47 E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the
48 same day.
- 49

50 **3.3 SUBSTRATE BOARD**

- 51 A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes and with end joints
52 staggered between rows. Tightly butt substrate boards together.
 - 53
 - 54 1. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of
55 roof according to membrane roofing system manufacturer's instructions.
 - 56

1 **3.4 INSULATION INSTALLATION**

- 2 A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left
- 3 exposed at the end of the workday.
- 4 B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof
- 5 insulation.
- 6 C. Install tapered insulation under area of roofing to conform to slopes indicated.
- 7 D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches
- 8 or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a
- 9 minimum of 6 inches in each direction.
- 10 E. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to
- 11 deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to
- 12 deck type.
 - 13 1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 14 2. Set each subsequent layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus
 - 15 25 deg F of equiviscous temperature.
 - 16 3. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.
- 17 F. Install slip sheet over insulation and immediately beneath membrane roofing.

18
19 **3.5 VAPOR RETARDER AND INSULATION – UNDER MEMBRANE**

- 20 A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
 - 21
 - 22 1. Extend vapor retarder under cant strips and blocking to deck edge.
- 23 B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- 24 C. Attachment of Insulation:
 - 25 1. Mechanically fasten first layer of insulation to deck in accordance with roofing manufacturer's instructions.
 - 26 2. Embed second layer of insulation into full bed of adhesive in accordance with roofing and insulation
 - 27 manufacturers' instructions.
- 28 D. Lay subsequent layers of insulation with joints staggered minimum 6 inches from joints of preceding layer.
- 29 E. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- 30 F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and
- 31 around penetrations through roof.
- 32 G. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.
- 33 H. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches.
- 34 I. Do not apply more insulation than can be covered with membrane in same day.

35
36 **3.6 INSTALLATION OF ADHERED ROOF MEMBRANE**

- 37 A. Unroll roof membrane and allow to relax before installing.
- 38 B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- 39 C. Accurately align roof membrane and maintain uniform side and end laps of minimum dimensions required by
- 40 manufacturer. Stagger end laps.
- 41 D. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow
- 42 to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- 43 E. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install
- 44 fabric-backed roof membrane.
- 45 F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter
- 46 of roofing.
- 47 G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- 48 H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet
- 49 flashings, to ensure a watertight seam installation.
- 50 I. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and
- 51 sheet flashings.
- 52 J. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
- 53 K. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- 54 L. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping
- 55 ring.

- 1 **3.7 INSTALLATION OF MECHANICALLY FASTENED ROOFING MEMBRANE**
- 2 A. Thermoplastic membranes shall be mechanically attached to the structural deck with manufacturer specified
- 3 fasteners and plates.
- 4 B. On steel decks, membrane shall be positioned with seams perpendicular to the steel deck flutes.
- 5 C. Secure the membrane at the appropriate fastening density with the required manufacturer's fastener and fastening
- 6 plates. Refer to manufacturer's design requirements for density of fasteners.
- 7 **3.8 BASE FLASHING INSTALLATION**
- 8 A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing
- 9 system manufacturer's written instructions.
- 10 B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do
- 11 not apply to seam area of flashing.
- 12 C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- 13 D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure
- 14 a watertight seam installation.
- 15 E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.
- 16
- 17 **3.9 WALKWAY PAD INSTALLATION**
- 18 A. Install walkway pads according to manufacturer's instructions and in accordance with roofing manufacturer's
- 19 warranty requirements.
- 20
- 21 **3.10 FIELD QUALITY CONTROL**
- 22 A. Require site attendance of roofing and insulation material manufacturers daily during installation of the Work.
- 23 B. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface
- 24 preparation, roof membrane application, sheet flashing, protection, and drainage components, and furnish reports
- 25 to Architect.
- 26 1. Perform the following tests:
- 27 a. ASTM E1186 (Standard Guide for Air Leakage Site Detection in Building Envelopes and Air Barrier
- 28 Systems) tests to be performed during early construction.
- 29 1) Test Schedule: After all specified coats of fluid barrier applied or membrane adhered and
- 30 manufacturer's required curing time has elapsed, before installation of exterior continuous
- 31 insulation.
- 32 2) Test Quantity: 2 sets of 25 per barrier type, as directed by Owner, BCxP, and Architect.
- 33 3) Pass Criteria: no visible bubbles in the testing fluid.
- 34 b. ASTM E7877 (Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof
- 35 Membranes) tests to be performed during early construction.
- 36 1) Test Schedule: At 10% TPO membrane installation completion, after membrane adhered,
- 37 joints taped/waterproofed, and manufacturer's required curing time has elapsed, before
- 38 installation of exterior continuous insulation.
- 39 2) Test Quantity: 2 tests, as directed by Owner, BCxP, and Architect.
- 40 3) Pass Criteria: No leaks detected.
- 41 c. ASTM D 8231 – 19, (Standard Practice for the Use of a Low Voltage Electronic Scanning System for
- 42 Detecting and Locating Breaches in Roofing and Waterproofing Membranes).
- 43 1) Test Schedule: At 100% TPO membrane installation completion, after membrane adhered,
- 44 joints taped/waterproofed, and manufacturer's required curing time has elapsed, before
- 45 installation of exterior continuous insulation
- 46 2) Test Quantity: 1 test.
- 47 3) Pass Criteria: No leaks detected.
- 48 C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation
- 49 on completion.
- 50 D. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not
- 51 comply with specified requirements.
- 52
- 53 **3.11 CLEANING**
- 54 A. Remove bituminous markings from finished surfaces.
- 55 B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning
- 56 advice and conform to manufacturer's documented instructions.
- 57 C. Repair or replace defaced or damaged finishes.
- 58

**SECTION 07 62 00
SHEET METAL FLASHING AND TRIM**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Aluminum fascia, copings and trim.
 - 2. Counterflashing.
 - 3. Drip edges.
 - 4. Parapet scuppers.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.
- C. Install in accordance with ANSI/SPRI ES-1.
- D. Conform to ASCE 7-10 for jurisdictions requiring the 2015 IBC.
- E. Conform to ASCE-716 for jurisdictions requiring the 2018 IBC.
- F. Determine Risk Category as is applicable to this particular building and location, i.e. most buildings with less than 300 occupants are Category 2; most buildings with more than 300 occupants are Category 3; medical and essential facilities are category 4; and conform to those requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 1. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.
- C. Samples for Initial Selection: For each exposed product and for each finish specified.
- D. Maintenance data.
- E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. First-in-Place Mockups: Provide 25 sf of coping mockup in place. Include corner conditions.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

- 1 A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak
- 2 proof, secure, and non-corrosive installation.
- 3

4 PART 2 - PRODUCTS

5 2.1 PERFORMANCE REQUIREMENTS

- 7 A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally
- 8 induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation,
- 9 or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall
- 10 remain watertight.
- 11 B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's
- 12 "Architectural Sheet Metal Manual." Comply with dimensions and profiles shown unless more stringent requirements
- 13 are indicated.
- 14 C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
- 15 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- 16

17 2.2 SHEET METALS

- 18 A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable,
- 19 temporary protective film before shipping.
- 20 B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to
- 21 suit forming operations and performance required.
- 22 1. As-Milled Finish: One-side bright mill finish.
- 23 2. Alclad Finish: Metallurgically bonded surfacing to both sides, forming a composite aluminum sheet with
- 24 reflective luster.
- 25 3. Factory Prime Coating: Where painting after installation is indicated, pretreat with white or light-colored,
- 26 factory-applied, baked-on epoxy primer coat; minimum dry film thickness of 0.2 mil.
- 27 4. Exposed Coil-Coated Finishes:
- 28 a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent
- 29 PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces
- 30 to comply with coating and resin manufacturer's written instructions.
- 31 5. Colors: As selected by Architect from manufacturer's standard range and as indicated on Drawings.
- 32 C. Stainless Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
- 33 1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled).
- 34

35 2.3 UNDERLAYMENT MATERIALS

- 36 A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.
- 37 B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.
- 38 C. Polyethylene Sheet: 6-mil-thick polyethylene sheet complying with ASTM D 4397.
- 39

40 2.4 MISCELLANEOUS MATERIALS

- 41 A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and
- 42 other miscellaneous items as required for complete sheet metal flashing and trim installation.
- 43 B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable
- 44 fasteners designed to withstand design loads.
- 45 1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
- 46 2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
- 47 3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
- 48 4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- 49 5. Fasteners for Zinc-Coated (Galvanized), Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel
- 50 according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- 51 6. Spikes and Ferrules: Same material as gutter, with spike with ferrule matching internal gutter width.
- 52 C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper
- 53 backing. Provide permanently elastic, nonsag, nontoxic, non-staining tape.
- 54 D. Elastomeric Sealant: ASTM C1311, butyl rubber sealant (non-skimming); of type, grade, class, and use classifications
- 55 required to seal joints in sheet metal flashing and trim and remain watertight.
- 56 E. Epoxy Seam Sealer: Two-part, non-corrosive, aluminum seam-cementing compound, recommended by aluminum
- 57 manufacturer for exterior nonmoving joints, including riveted joints.

- 1 F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.
- 2 Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious
- 3 impurities.
- 4 G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.
- 5

6 **2.5 FABRICATION, GENERAL**

- 7 A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural
- 8 Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Fabricate
- 9 items at the shop to greatest extent possible.
- 10
- 11 1. Obtain field measurements for accurate fit before shop fabrication.
- 12 2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and
- 13 levels indicated, with exposed edges folded back to form hems.
- 14 3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces
- 15 exposed to view.
- 16 B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but
- 17 not less than that specified for each application and metal.
- 18 C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with
- 19 SMACNA recommendations.
- 20 D. Expansion Provisions: Where lapped or bayonet-type expansion provisions cannot be used, form expansion joints of
- 21 intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- 22 E. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless
- 23 otherwise indicated.
- 24 F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, non-
- 25 corrosive metal.
- 26 G. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
- 27 Rivet joints where necessary for strength.
- 28

29 **2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS**

- 30 A. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch wide wall
- 31 flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the
- 32 following materials:
- 33
- 34 1. Aluminum: 0.032 inch.
- 35 2. Scuppers shall be completely lined with 60 mil EPDM.
- 36

37 **2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS**

- 38 A. Roof-Edge Flashing and Fascia Cap: Fabricate in minimum 96-inch-long, but not exceeding 10-foot- long, sections.
- 39 Furnish with 6-inch-wide, joint cover plates. Fabricate from the following materials:
- 40
- 41 1. Aluminum: 0.050 inch thick.
- 42 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- 43
- 44 B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same
- 45 thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for
- 46 fasteners on interior leg. Miter corners, seal, and solder or weld watertight. Fabricate from the following materials:
- 47
- 48 1. Aluminum: 0.050 inch thick.
- 49 2. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
- 50
- 51 C. Base Flashing: Fabricate from the following materials:
- 52
- 53 1. Aluminum: 0.040 inch thick.
- 54 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- 55
- 56 D. Counterflashing and Flashing Receivers: Fabricate from the following materials:
- 57
- 58 1. Aluminum: 0.032 inch thick.

- 1 2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- 2
- 3 E. Roof-Penetration Flashing: Fabricate from the following materials:
- 4 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- 5
- 6 F. Roof-Drain Flashing: Fabricate from the following materials:
- 7 1. Stainless Steel: 0.016 inch thick.
- 8

9 **2.8 WALL SHEET METAL FABRICATIONS**

- 10 A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch-high, end dams where flashing is discontinuous. Fabricate from the following materials:
- 11 1. Stainless Steel: 0.016 inch thick.
- 12 B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
- 13 1. Aluminum: 0.032 inch thick.
- 14 2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- 15 C. Wall Expansion-Joint Cover: Fabricate from the following materials:
- 16 1. Aluminum: 0.040 inch thick.
- 17 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- 18
- 19
- 20
- 21
- 22
- 23
- 24

25 **2.9 FINISHES**

- 26 A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- 27
- 28 B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 29
- 30 C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- 31
- 32
- 33
- 34 D. Color: As selected by Architect from manufacturer's standard range.
- 35

36 **PART 3 - EXECUTION**

37

38 **3.1 UNDERLAYMENT INSTALLATION**

- 39 A. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.
- 40
- 41 B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- 42
- 43

44 **3.2 INSTALLATION, GENERAL**

- 45 A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
- 46
- 47
- 48 B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
- 49 1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
- 50 2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- 51 3. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
- 52
- 53 C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
- 54 D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.
- 55
- 56
- 57
- 58

- 1 E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and
2 dimensions of surfaces to be covered before fabricating sheet metal.
- 3 1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- 4 F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a
5 maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type
6 expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing
7 hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- 8 G. Seal joints with elastomeric sealant as required for watertight construction.
- 9 H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be
10 soldered to a width of 1-1/2 inches except where pre-tinned surface would show in finished Work.
- 11 1. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill
12 joints completely. Completely remove flux and spatter from exposed surfaces.
- 13

14 **3.3 ROOF DRAINAGE SYSTEM INSTALLATION**

- 15 A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA
16 recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof
17 drainage system.
- 18 B. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a
19 minimum of 4 inches in direction of water flow.
- 20 C. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct
21 elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
- 22

23 **3.4 ROOF FLASHING INSTALLATION**

- 24 A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's
25 written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners
26 where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be
27 permanently watertight and weather resistant.
- 28 B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's
29 "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous
30 cleat anchored to substrate at staggered 3-inch centers.
- 31 C. Copings: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet
32 Metal Manual" and as indicated.
- 33 1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.
- 34 2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.
- 35 D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for
36 elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and
37 tighten.
- 38 E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing
39 in receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing
40 joints a minimum of 4 inches and bed with sealant.
- 41 F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other
42 items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.
- 43

44 **3.5 WALL FLASHING INSTALLATION**

- 45 A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA
46 recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening
47 components such as windows, doors, and louvers.
- 48 B. Through-Wall Flashing: Installation of through-wall flashing is specified in Division 4 Section "Unit Masonry
49 Assemblies.
- 50 C. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches
51 beyond wall openings.
- 52

53 **3.6 CLEANING AND PROTECTION**

- 54 A. Clean and neutralize flux materials. Clean off excess solder and sealants.
- 55 B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On
56 completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems,
57 and pieces of flashing. Maintain in a clean condition during construction.

- 1 C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair
- 2 by finish touchup or similar minor repair procedures.
- 3
- 4

END OF SECTION

**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Roof hatches.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for metal ladders for access to roof hatches.
 - 2. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counter flashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

1.3 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

- A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated.
- B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized to comply with ASTM A 123/A 123M, unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

- A. Polyisocyanurate Board Insulation: ASTM C 1289, 1 inch thick.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- C. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other non-corrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners.
- D. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.
- E. Elastomeric Sealant: ASTM C 920, [polyurethane] sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Roofing Cement: ASTM D 4586, non-asbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 ROOF HATCHES

- A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated single-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weathertight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide model NB-50TB by Bilco, or approved equal by one of the following:
 - a. Babcock-Davis Company.
 - b. J. L. Industries, Inc.

- 1 c. Milcor Inc.
- 2 d. Or approved equal.
- 3 2. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. external and 20-lbf/sq. ft. internal loads.
- 4 3. Type and Size: Single-leaf lid; 30" x 54".
- 5 4. Curb and Lid Material: Galvanized steel sheet, 0.079 inch thick.
- 6 a. Finish: High performance organic coating.
- 7 5. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
- 8 6. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
- 9 7. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
- 10 8. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps
- 11 inside and outside.

12 **2.4 HATCH RAIL SYSTEM**

- 13 A. Basis-of-Design Product: Subject to compliance with requirements, provide model RL2-NB hatch rail system by Bilco,
- 14 or comparable product by one of the following:
 - 15 1. Babcock-Davis Company.
 - 16 2. Milcor Inc.
 - 17 3. Or approved equal.
- 18 B. Performance Characteristics:
 - 19 1. High visibility safety yellow powder coat paint finish.
 - 20 2. Hatch rail system shall attach to the cap flashing of the roof hatch and shall not penetrate any roofing
 - 21 material.
 - 22 3. Hatch rail system shall satisfy the requirements of OSHA 29 CFR 1910.29 and shall meet OSHA strength
 - 23 requirements with a factor of safety of two.
 - 24 4. Corrosion resistant construction with a five-year warranty.
 - 25 5. Hinged gate shall ensure continuous barrier around the roof hatch.
 - 26 6. Self-closing gate hinge and positive latching system provided with hatch rail system.
- 27 C. Posts and Rails: 1-1/4 inch 6061 T6 schedule 40 aluminum pipe.
- 28 D. Hardware: Mounting brackets shall be 3/8" (9mm) thick extruded aluminum. Pivoting post guides with compression
- 29 fittings and latching mechanism shall be cast aluminum. Self-closing hinges and all fasteners shall be type 316 stainless
- 30 steel.

31 **2.5 FALL ARREST SYSTEM**

- 32 A. Subject to compliance with requirements, provide a Fall Arrest System by Kee Safety, or comparable product by one
- 33 of the following:
 - 34 1. Engineered Fall Protection.
 - 35 2. HySafe.
 - 36 3. Or approved equal.
- 37 B. Performance Requirements:
 - 38 1. Number of Users: five.
 - 39 2. Deceleration Device: Appropriate length lanyards that meet or exceed ANSI Z359.1 and OSHA 1926.104.
 - 40 3. Harness: Full body harness with single back D-ring that meets or exceeds ANSI Z359.1 and OSHA 1926.104.
- 41 C. Materials:
 - 42 1. Cable: Stainless Steel AISI 316L.
 - 43 2. Anchorage: Carbon steel.
- 44

45 **PART 3 - EXECUTION**

46 **3.1 EXAMINATION**

- 47 Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other
- 48 conditions affecting performance of work.
- 49
- 50

51 **3.2 INSTALLATION**

- 52 A. General: Install roof hatch according to manufacturer's written instructions. Anchor hatch securely in place and
- 53 capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required
- 54 for completing roof accessory installation. Install roof hatch to resist exposure to weather without failing, rattling,
- 55 leaking, and fastener disengagement.

- 1 B. Install roof hatch to fit substrates and to result in watertight performance.
- 2 C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic
- 3 action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by
- 4 manufacturer.
- 5 1. Coat concealed side of stainless steel roof accessories with bituminous coating where in contact with wood,
- 6 ferrous metal, or cementitious construction.
- 7 2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious
- 8 or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of
- 9 polyethylene underlayment.
- 10 3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for
- 11 waterproof performance.
- 12 D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil
- 13 canning, buckling, or tool marks.
- 14 E. Seal joints with sealant as required by manufacturer of roof accessories.
- 15 F. Check roof hatch for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and
- 16 hardware.
- 17

18 **3.3 CLEANING AND PROTECTION**

- 19 A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering. Touch up factory-
- 20 finished surfaces in accordance with Manufacturer's recommendations.
- 21 B. Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
- 22 C. Clean and neutralize flux materials. Clean off excess solder and sealants.
- 23 D. Remove temporary protective coverings and strippable films as roof specialties are installed.
- 24 E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar
- 25 minor repair procedures.
- 26
- 27

END OF SECTION

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SECTION 07 72 33
VEGETATED ROOF SYSTEM

PART 1: GENERAL

1.1 SCOPE

Provide equipment, materials, tools, and labor to install vegetated roofing modules. Modules to include growth media and plants. This work shall also include edge treatments, custom shaping of modules, and installing paver stones or ballast, slip sheet/root barrier and irrigation system, if specified.

1.2 SUBMITTALS

- A. To fully disclose merits of system and specifications, provide three (3) product maintenance guides and design guides featuring project photographs of completed jobs.
- B. To provide evidence of wind and fire safety, demonstrate video evidence of firespread testing and high speed wind resistance testing (minimum of 110 mph), and report of full scale dynamic wind uplift testing results. Provide green roof system wind uplift rating according to "Standard test method for wind resistance of modular vegetated roof assembly (CAN/CSA-A123.24-15)."
- C. In order to provide third party perspective, provide reference sheet listing 6 references of owners and caretakers of green roof system.
- D. To provide visual reference, conduct site visit and proposed dates to visit for 3 existing projects using same green roof system, within 50 miles of projectsite.
- E. To provide visual reference, provide two (2) sample vegetated modules, showing same or similar product grown to maturity, with homogeneous mix of cutting grown plants, with 95 % or greater coverage and fully rooted into entire soil profile, as it will be delivered to job site. Sample to be provided to owner of property and landscape architect for review.
- F. To demonstrate soil quality, provide two (2) plastic bags, each containing a 1 cup (8 oz.) sample of growing medium.
- G. To demonstrate safe connection, provide two (2) sample module connectors intended to prevent displacement of modules against wind uplift.
- H. To conform to project requirements, provide additional agreements of warranty and maintenance contract.
- I. To ensure proper care, provide manufacturer-approved project-specific operation manual.
- J. To ensure proper installation, provide written documentation of installation procedures. If required for warranty and maintenance purposes, provide documentation showing installer as being certified to install system.
- K. To ensure Installer has been trained to efficiently and correctly install green roof system, provide certificate of completion of training issued by green roof system manufacturer.
- L. To facilitate planning and create installation efficiency, indicate length of time required to install the green roof.
- M. To provide evidence of wind and fire safety, demonstrate video evidence of fire-spread testing and high speed wind resistance testing (minimum of 110 mph), and report of full scale dynamic wind uplift testing results. Provide green roof system wind uplift rating according to "Standard test method for wind resistance of modular vegetated roof assembly (CAN/CSA-A123.24-15)."
- N. To ensure that green roof system manufacturer produces consistently uniform and reliable product that meets or exceeds industry standards for fire and foot traffic resistance, provide copy of FM Approval report issued for evaluation according to FM Standard 4477.
- O. To ensure that green roof meets or exceeds FM Approval Standard 4477 for Spread of Flame testing in accord with ASTM E108-10 Spread of Flame, provide Approval Examination Report with Class A Results.
- P. Provide an engineering study that green roof system will meet or exceed 1.2 inches of Maximum Water Capacity in accord with FLL or ASTM E-2397 standards.
- Q. Provide a particle size distribution report by a certified soil testing facility which demonstrates the green roof growing media will meet minimum ASTM E-2397 and FLL Guidelines for multi- course extensive sites.
- R. To ensure proper plant selection and efficient delivery, provide address and contact information of

1 professional horticulturist who will oversee planting and cultivation of modules, within 300 miles of project
2 location.

3 S. Upon completion, arrange for owner staff to attend an onsite maintenance training with
4 manufacturer representative.

5 T. Upon completion, submit green roof manufacturer warranty issued in owner's name.
6

7 **1.3 QUALITY ASSURANCE**

8 A. No deviation should be made from this specification. Installer assumes liability for any deviations
9 from specification.

10 B. Only manufacturer-approved Installers may perform the green roof installation. Special designation may be
11 required for single source or overburden removal warranties. Please contact your local green roof system
12 supplier for a list of approved installers to provide estimates for you.

13 C. Prior to installing green roof modules, the following procedures are to be conducted:
14

- 15 1. The building Owner, Architect, or Engineer shall verify that the roof is properly designed and
16 constructed to adequately support the load of the green roof system.
- 17 2. The roof is to be flood tested for water tightness for 24 hours. Water testing shall be witnessed and
18 confirmed in writing by Owner's Representative and/or Design Professional, Waterproofing Contractor,
19 Membrane Manufacturer, and Installation Contractor.
- 20 3. Slip sheet/root barrier to be properly installed, seams overlapped and bonded, in accord with
21 architect's and manufacturer's specifications.
- 22 4. The roof is to be inspected and determined ready to accept the green roof modules by a Technical
23 Representative of the Installer.

24
25 D. Once the green roof installation is completed, an inspection is to be conducted by a Technical
26 Representative of the Installer to verify that the green roof modules have been installed tight against each
27 other, in straight rows, corners aligned, properly oriented, and tight against the edging.
28

29 **1.4 PRE-INSTALLATION MEETING**

30 A. Installer to convene one week before starting work of this section. Review green roof installation
31 standardized procedures with supervisory staff and installation team.

32 B. Schedule certified installation personnel to supervise entire green roof installation.

33 C. Ensure that the slip sheet material meets membrane and green roof manufacturer specifications.

34 D. Ensure that edging is perforated at the bottom to allow water to drain freely and is installed between
35 modules and stone ballast or wherever parapet or paver is of insufficient height/thickness to contain
36 the soil from the subterranean green roof modules.

37 E. Ensure that soil and debris will be swept clean before placing each module.

38 F. Configure installation to minimize or eliminate walking on the plants during installation.
39

40 **PART 2: PRODUCTS**

41
42 **2.1 VEGETATED GREEN ROOF MODULE MANUFACTURER**

43 A. LiveRoof is the Basis of Design.
44

45 1. Any other products must confirm to all performance criteria, documentation, submittals, soil
46 specification, planting methods and plant material.

47 2. Any other products must be approved by architect and owner prior to award.
48

49 B. For ease of handling during installation, future maintenance activities, storage, and reduction in special sizes,
50 the module system to be used comprising of 1' x 2' x 3¼" for the Standard System
51 tray; soil height raised to approximately 4¼" elevation for the Standard System with removable soil elevator.

52 C. To meet sustainability objectives, modules to be 100% post-industrial recycled polypropylene with 100 mil
53 thick walls.

54 D. To meet plant growth and health requirements, and maximum storm water absorption, module system to

- 1 have a minimum of 337 ft³ of soil per 1000 ft² for the Standard System of coverage.
- 2 E. To resist photo-degradation, module color to be black.
- 3 F. For optimal root health and drainage, module to have positive drain holes placed at lowest point in the
- 4 module.
- 5 G. For proper roof drainage and root health, module bottom to have water dispersal via its drain channels of
- 6 approximately 7.0 gallons per minute per lineal foot.
- 7 H. To optimize plant health and maximize storm water absorption, soil height approximately 4¼" elevation for
- 8 the Standard System.
- 9 I. To shield the module from photo-degradation and to promote plant health via sharing of water and
- 10 nutrients between the modules, the soil continuum is to be monolithic, approximately 1" inch taller for the
- 11 Standard System than modules, and shall obscure modules during all 12 months of the year for optimal
- 12 year-round aesthetic presentation.
- 13 J. For plant health by sharing of water and nutrients between modules, soil to be joined via
- 14 subterranean moisture portals uniting soil and roots from module to module.
- 15 K. To ensure minimal maintenance, plant material to cover minimum of 95 % of surface area of soil within
- 16 modules and be fully rooted into entire soil profile at time of delivery.
- 17 L. To ensure proper plant selection, efficient delivery and sustainable objectives, module planting and
- 18 cultivation to occur under supervision of professional horticulturist located within 300 miles of project location.
- 19 M. To ensure adherence to proper installation procedures, green roof system manufacturer to provide the
- 20 Installer with in-person training of Standardized Installation Procedures.
- 21 N. To facilitate design, provide photos and descriptions of plant mixture or individually specified plant species
- 22 to be used and specify density of accent plantings.
- 23 O. To optimize logistical efficiency, during the growing season, April to Sept. 30, growing time and method to be
- 24 coordinated so as to mature on or before installation date. Time to mature depends upon plant selection,
- 25 climate, and time or year.

27 2.2 GROWING MEDIUM

- 28 A. To ensure sustainability, plant health and longevity, and minimal shrinkage, soil to be enhanced German FLL
- 29 93 +% (by dry weight) inorganic content.
- 30 B. To ensure proper soil environment and allow for predictable maximum roof load during rain storm, module
- 31 saturated weight (with soil and fully vegetated) to be approximately 27-29 lbs/ft² for the Standard System.

34 2.3 PLANTS

35 Be sure to speak with your LiveRoof representative to select correct plants for your design intent.

- 36
- 37 A. Project must be bid with the specified plant varieties at the specified densities.
- 38 B. In order to protect the environment during production and to reduce or prevent the need for ongoing
- 39 insect control, the cuttings used in the planting are to have been field harvested from within 60 feet of
- 40 established plantings of Native "Banker Plants". Banker plants to consist of a
- 41 20 species assortment of native plants known to attract beneficial predators such as lady beetles, praying
- 42 mantis, lacewing, predatory mites, predatory wasps, and others. Production practices to utilize no pre-emergent
- 43 herbicides, and to include compost, mulch, and other earth friendly and organic growing methods.

45 2.4 SLIP SHEET (Root Barrier / Protection Layer)

- 46 A. Approved by waterproofing Membrane Manufacturer. Confirm compatibility of slip sheet and waterproofing
- 47 membrane with waterproofing manufacturer.
- 48 B. Conventional Membrane Roof Assembly
- 49
- 50 1. Minimum 1 mm (40 mil) thickness with overlapped and effectively bonded seams to ward against root
- 51 penetration and to keep waterproofing layer safe and clean from soil during installation. Examples of
- 52 commonly used slip sheets include the following. Installer to confirm compatibility of slip sheet and
- 53 waterproofing membrane with waterproofing membrane manufacturer.
- 54

- 1 a. Welded Seam Types - 1 mm (40 mil) or greater thickness
- 2 -TPO, with seams heat welded
- 3 -PVC, with seams heat welded
- 4 -Polypropylene, with seams heat welded
- 5 -HDPE, with seams heat welded
- 6 b. Glued Seam Types - 1 mm (40 mil) or greater thickness
- 7 -EPDM, with seams overlapped a minimum of 75 mm and glued with roll out adhesive or double
- 8 sided tape adhesive of the type that is impervious to and not affected by moisture, and
- 9 recommended by the manufacturer.
- 10 c. Low profile drain board of appx. 0.5 mm (17 mil) thickness, with edges overlapped 75 mm and glued
- 11 with manufacturer approved adhesive.
- 12 C. Do not use duct tape or adhesive for seaming that is not approved by the membrane
- 13 manufacturer.
- 14 D. Never use moisture holding fabric, such as needle-punched / non-woven polyethylene or felt, under the
- 15 green roof system with "conventional" (non-inverted) membrane roof assemblies. Such materials may trap
- 16 aggregates and are impossible to sweep during installation and stay wet and encourage root growth and
- 17 root penetration, which is especially detrimental if woody plants become established as such plants have
- 18 woody root systems and may potentially cause roof leaks. This could lead to impeded drainage and
- 19 compromise plant health.
- 20 E. In cases where electronic leak detection may be desired, a fiber-backed drainboard may be used. Fiber-backed
- 21 drainboards are only recommended when electronic leak detection is desired, and only when vegetated with
- 22 Sedums or Sempervivums, or other succulents, as these plants are sparsely-rooted and not prone to rooting
- 23 into the fiber of the drainboard.

24
25 **2.5 ACCESSORIES**

26 **A. Edging**

- 27 1. Edging required at perimeter of green roof when exposed, or adjacent to stone ballast or
- 28 conventional pavers.
- 29 2. Aluminum, L-shaped Edge restraint to be 2.75" x 3.25" for 2.5" green roof system depth, 4.25" x 3.25"
- 30 for 4.25" green roof system depth, 6.5" x 3.25" for 6" green roof system depth, and 8.5" x 3.25" for
- 31 8" system depth.
- 32 3. Edge restraint to be perforated to allow water to drain freely.
- 33 4. Edge restraint to be bronze anodized.
- 34 5. Edge pieces to be connected with aluminum sliding connectors. For the 6.5" x 3.5" and the 8.5" x 3.5"
- 35 sizes, two sliding connectors must be used at each connection point.
- 36 6. Edging design must allow for sliding connector to be used to transition from 4.25" to 6" and/or to 8"
- 37 green roof modules.
- 38 7. Edging must be certified as extruded and stamped in the USA.
- 39 8. Corners to be prefabricated by the manufacturer, or may be bent or welded by the
- 40 contractor.
- 41 9. Edging installations that are not surrounded by stone ballast or pavers should be secured to the green
- 42 roof modules to ensure it is held in place. Edging should be fastened using 3/16" diameter wide-domed
- 43 blind rivets into 0.192"-0.196" (drill size #11) holes on 12" centers.

44 **B. Irrigation System**

- 45 1. System to be used only to keep green roof in optimal condition during prolonged periods of heat and
- 46 drought and to optimize the evaporative cooling effect of the green roof during such weather events.
- 47
- 48 a. Sloped green roof applications will drain more quickly, thus potentially thinning plants and exposing
- 49 soil to erosion, and therefore will have an increased need for irrigation.
- 50 b. Use a standard SCH 40 Gray PVC (Polyvinyl Chloride Plastic) pipe for irrigation lines, with SCH 80
- 51 Gray solvent weld PVC fittings. Matched precipitation irrigation head recommended.
- 52 c. Consult a qualified irrigation specialist to determine appropriate design configuration of irrigation,
- 53 including pipe diameter, layout, head style and spacing.
- 54

- 1 i. Function: fully automatic or manual.
- 2 ii. Controls:
- 3
- 4 1. Automatic rain sensor optional.
- 5 2. Irrigation controller shall be outdoor-type.
- 6 3. All sprinklers will have matched precipitation on the same zone.
- 7
- 8 iii. Piping:
- 9
- 10 1. Install pipe cradles / risers between modules to allow for water to flow beneath
- 11 irrigation lines. Lay pipe atop risers. Fill gap with engineered growing medium
- 12 supplied by the green roof system manufacturer. Fill
- 13 slightly above the level of the modules to account for soil settling. Remove soil inserts
- 14 unless advised that they are biodegradable.
- 15 2. Irrigation lines should never lie directly on the membrane around green roof modules
- 16 as this may lead to ponding water which can cause plant or roof failures. Always raise
- 17 irrigation lines so that water may flow beneath them toward drain or gutter areas.
- 18
- 19 iv. Valves:
- 20
- 21 1. A master valve shall be installed on the mainline after the back flow device.
- 22 2. All valves to be covered by a 6" valve box.
- 23 3. All wire connections to be waterproof, UL approved.
- 24 4. To be a manual drain type. Install automatic freeze protection drain valves on all main
- 25 and lateral piping.
- 26

27 **C. Module Connectors**

- 28
- 29 1. To enhance wind uplift resistance, system to be interconnected using specially designed and successfully
- 30 tested module connectors.
- 31 2. 1-3/4" diameter by 0.1" thick plastic discs to be inserted horizontally into slots at corners of each module.
- 32 A ratio of approximately 1 module connector to green roof module is appropriate for most designs.
- 33

34 **2.7 SLOPED APPLICATIONS**

- 35 **A.** See structural and architectural drawings for slope containment.
- 36

37 **PART 3: EXECUTION**

38

39 **3.2 GREEN ROOF INSTALLATION MUST BE CONDUCTED BY A MANUFACTURER-**

40 **APPROVED INSTALLER.** Special designation may be required for single source or overburden removal warranties.

41

42 **3.3 PREPARATION OF ROOF SURFACE**

- 43 **A.** Slip sheet/root barrier, specified by architect and approved by waterproofing and green roof system
- 44 manufacturer, of 1-1.5 mm (40-60 mi) thickness with overlapped and effectively bonded seams to ward against
- 45 root penetration and to keep waterproofing layer safe and clean from soil during installation.
- 46
- 47 1. Do not use duct tape or adhesive for seaming that is not approved by the membrane
- 48 manufacturer.
- 49 2. Never use moisture holding fabric, such as needle-punched polyethylene or felt, under the green roof
- 50 system.
- 51 **B.** Experienced Contractor to install slip sheet/root barrier in accordance with manufacturer's
- 52 recommendations.
- 53 **C.** All surfaces to be smooth, free of debris, soil, and grit prior to placing modules. All materials to be tested
- 54 water tight and free draining prior to module placement.

- D. All surfaces to be maintained clean and free of debris, soil, and grit during installation process via use of broom. Never walk upon such materials as they may damage membranes.

3.4 INSTALLATION SEASON

Module Installation to be conducted:

- A. When plants are properly adapted and acclimatized to local weather conditions.
- B. When weather is above 33° F and there is no ice on the roof and engineered soil is unfrozen.
- C. No later or earlier than the cut off date required by the green roof system provider’s warranty terms, if applicable. In areas of cold-winter temperatures, installation season is typically April 1 to November 15.
- D. When the Owner and General Contractor can ensure that, during and after the green roof installation, no foot traffic will be allowed on the plantings. If the Owner or GC cannot guarantee that modules will not experience late fall, winter or early spring foot traffic, the green roof installation should not occur until the following spring when other trades have finished their work.

3.5 DELIVERY, STORAGE, HANDLING, PROTECTION

- A. Green roof modules are to be delivered in good condition free from shipping damage.
- B. If plastic wrapped, modules are to be kept out of the sun to prevent overheating.
- C. Modules are to be installed on the roof top within 4 hours of delivery.
- D. On the job site, modules are to be handled to prevent damage to the modules themselves and all roofing components.
- E. To ensure optimum plant condition and safety, modules must be conveyed to the roof using a rack designed specifically for this use and constructed according to engineer approved and stamped plans. DO NOT stack modules during conveyance to rooftop or installation.
- F. Modules are to be conveyed to roof surface with equipment designed to carry the collective load of the green roof modules and transport rack. Account for decreasing load limits when boom (of crane or fork lift) is extended. Use crane stabilizers and take all necessary precautions to protect building and personnel.
- G. Never exceed the load capacity of the roof deck when placing green roof modules on the roof.
- H. When suspending modules and conveyance rack above deck, take precautions to stabilize and prevent twisting of conveyance rack. Four tires or two four inch thick sheets of Styrofoam is recommended.
- I. During installation, protect the roof deck and membranes with appropriate material such as plywood sheeting. Never scrape or puncture slip sheet or membranes. Keep roof surfaces free of soil, grit, or debris at all times with broom. Never set modules on top of soil, dirt or grit.
- J. Transport conveyors to be run parallel to the line of installation.
- K. Transport carts to have pneumatic tires, to be wheeled about only upon protective plywood sheeting, and to be loaded so as not to exceed weight capacity of roof deck.

3.6 SAFEGUARDING SYSTEM INTEGRITY

Before working on roof, all Installers and Laborers to be:

- A. Properly instructed in safety procedures and provided with green roof manufacturer’s Installation Standardized Procedures.
- B. Instructed to keep all work surfaces clean and debris free.
- C. To report immediately any damage to membranes, protective sheeting, or drain elements to supervisor, and to make appropriate repairs before proceeding.
- D. Instructed in proper methods of green roof installation by manufacturer trained and approved representative of installation company.

3.7 LAYING (PLACING) MODULES

- A. Module installation to follow behind installation of slip sheet/root barrier, irrigation system, pavers, ballast, and edging.
- B. Module installation to be conducted in strict accordance with manufacturer installation guidelines. Surface to be clean and swept free of soil, dirt, stones or grit before placing each module. Rows to be straight, modules to be tight against each other with edges overlapping and arranged in proper directional orientation. As soon as one row of modules is surrounded completely by the parapet, edging, or other modules, pull all

- 1 of the plastic soil elevator inserts out of the modules. Pull the soil elevators while standing on the slip sheet
- 2 and avoid walking on the plants.
- 3 C. As each row of modules is installed tightly together, insert module connectors in module slots facing the
- 4 installer. Line up the next row of modules and slide into place so that the module connectors each hold
- 5 four module corners together.
- 6 D. Module installation to be conducted in accordance with green roof design.
- 7 E. Modules to be placed directly over RoofBlue risers atop appropriate slip sheet/root barrier.
- 8 F. It is recommended that any custom cutting/fitting be oriented on the high side (top), or sides of the roof. It is
- 9 recommended that the cut side of the module be set tight against the edging or toward the side of an intact
- 10 module so as to prevent soil spillage. If custom cutting must be done on the low, draining, side of the roof, it is
- 11 imperative that no filter cloth be inserted as it could impede drainage. It is best to orient the cut side against
- 12 another module, facing upstream.
- 13 G. After installing modules, they should be immediately watered so as to thoroughly moisten the media from
- 14 top to bottom. Water shall be of suitable quality for plant growth and irrigation system or hoses and
- 15 sprinklers may be used for such purpose. Note: it takes approximately 1 inch of water for the Standard
- 16 System of water, or 1 ¼ gallons per module for the Standard System per module to moisten each module
- 17 thoroughly.
- 18 H. First maintenance visit to be conducted two (2) weeks after first plant delivery date and continued
- 19 according to Section 3.7. Maintenance visits performed by owner and maintenance contractor.
- 20 Installer to perform 2 years maintenance commencing completion of green roof systems
- 21 installation.
- 22

23 **3.8 WARRANTY**

- 24 A. 50 Year Module Limited Warranty: Green Roof system manufacturer shall provide limited fifty
- 25 (50) year guarantee that product will be free of material defects and against photodegradation.
- 26
- 27 1. Installer shall complete and submit warranty registration form and post-installation punch list to
- 28 manufacturer within 60 days of delivery to complete warranty registration.
- 29 B. 1 Year Plant Limited Warranty shall be issued by green roof system grower or supplier. Guarantee is
- 30 conditional upon documented maintenance according to green roof System manufacturer's Maintenance
- 31 Protocol and commences upon delivery of the green roof system.
- 32
- 33 1. By January 15, Maintenance Contractor to submit maintenance documentation to
- 34 manufacturer for prior year's maintenance activities. Failure to submit maintenance
- 35 documentation will void plant warranty.
- 36
- 37 C. 50 Year Riser Limited Warranty: Blue Roof Riser manufacturer shall provide limited fifty (50) year guarantee
- 38 that product will be free of material defects and against photodegradation.
- 39 D. Overburden Removal/Replacement Limited Warranty: Refer to section 07 5423

40 **3.9 MAINTENANCE**

- 41 A. Contractor Qualification: Owner to select specialty contractor for green roof. The company contracted to
- 42 care for the landscape maintenance should not be selected to care for the green roof unless their
- 43 company has green roof care experience and client references.
- 44 B. Documentation
- 45
- 46 1. Upon email request, Green Roof Manufacturer shall provide twice monthly informational email
- 47 maintenance protocol, free of charge, that shares current best maintenance practices, seasonal topics
- 48 related to plant care, and chronologically guides the maintenance contractor through the various steps of
- 49 the maintenance protocol beginning March 15 and ending Nov. 1 of each year.
- 50 2. Record all green roof maintenance events. Include name of person, date and activity.
- 51
- 52 a. If soil test, record lab, test, and results
- 53 b. If fertilizer, record type and amount applied per 1000SF

- 1 c. Record time needed for bi-weekly weed walk and drain inspection
- 2 d. If irrigation, record duration and quantity
- 3
- 4 **C.** Foot Traffic: Limit foot traffic to a random path a couple times per week by one person. Avoid walking in a
- 5 single path, standing in one place, or trampling plants. If parapet or adjoining wall must be serviced, plants
- 6 may be covered with plywood or foam sheeting for up to 4 hours intermittently, provided foliage is not wet
- 7 or frozen and conditions are not too hot or sunny.
- 8 **D.** Spring Maintenance (March to June)
- 9
- 10 1. Soil Testing and Fertilization. Approximately 2-3 weeks before spring "growth flush," administer an
- 11 annual soil test for PH and fertility levels. Growth flush varies by region, consult biweekly
- 12 maintenance protocol email for specific recommended testing date in project's region.
- 13 2. Maintain pH in the range of 6.5 to 8.0. In the event that pH falls below 6.0, consult the testing lab for
- 14 appropriate recommendations to increase alkalinity. If the soil is above 8.0, it can be made more acidic
- 15 with elemental sulphur or an application of acidifying fertilizer.
- 16 3. Maintain fertility in the normal range using a typical field soil fertility test as provided by A&L labs or
- 17 equivalent testing lab. Evaluate the various nutrient levels such as Nitrogen (N or NO₃N), Potassium (K),
- 18 Phosphorus (P). If the soil contains a low (L) amount of these nutrients, conduct a single application of a
- 19 high-quality controlled release fertilizer at the lab recommended rate. Ensure that the chosen fertilizer
- 20 contains NO Herbicides or
- 21 Pesticides. Follow the fertilizer labeled directions for application rate and use a rotary spreader to ensure
- 22 even fertilizer application. Runoff potential does exist and should be evaluated by the applicator in accord
- 23 with the site specifics; the greater the runoff sensitivity, the lower the application rate. All applications
- 24 of fertilizer are the sole responsibility of the applicator.
- 25 4. Mowing (optional)
- 26
- 27 a. If desired, conduct a single annual mowing in early April. Set the mower blade just above the
- 28 foliage in order to remove dried seed heads. Do not bag the clippings; instead, blow them into the
- 29 green roof so that they can decompose and nourish the soil.
- 30 b. Be safe, use protective equipment, including harnesses if required. Make sure the roof is free of
- 31 frost or other slipping hazards.
- 32
- 33 5. Conduct Biweekly Inspections
- 34
- 35 a. Weed Walk: Pull and dispose of all weeds before they flower and set seed. NEVER allow any
- 36 woody plant to establish in a green roof system, as they have deep root systems which can
- 37 damage roofing membranes.
- 38 b. Displaced Soil: Nesting birds may displace soil. Replace lost soil using only green roof
- 39 manufacturer approved engineered green roof soil.
- 40 c. Drainage Inspection: Inspect roof drains for any debris, pebbles or leaves and remove to ensure
- 41 proper drainage.
- 42 d. Debris Removal: Remove any debris blown onto the roof immediately to ensure no damage to
- 43 plants.
- 44 e. Pest Control: Monitor pest presence, as most pest problems are the result of an imbalance in the
- 45 relationship of pest organism and its natural biological controls and these problems may self-
- 46 correct. If pest problems are persistent, use organic and natural biological control agents to
- 47 restore balance. Pesticide use is discouraged and should always be considered secondary to
- 48 cultural and biological control measures, as pesticides can contaminate runoff water and cause
- 49 environmental damage. Pesticides shall only be applied by qualified and licensed applicators, and
- 50 only as required. All applications of pesticides are the sole responsibility of the applicator.
- 51
- 52 **E.** Summer Maintenance (June to September)
- 53

- 1 1. Conduct Biweekly Inspections
- 2 2. Irrigation
- 3
- 4 a. When planted with drought tolerant succulents, irrigation recommended as a temporary
- 5 management tool during prolonged hot dry weather to prevent plant thinning or death.
- 6 Prolonged hot dry weather is generally defined as periods of 75° F weather with less than 1" of
- 7 rainfall persisting for 2 weeks for the Lite system and 4 weeks for all other systems. This time
- 8 period will be less if the temperatures are hotter,
- 9 the climate warmer, on sloping roofs, and roofs exposed to persistent winds or reflected sunlight.
- 10 Such conditions can dry out the soil and can cause plant dormancy or, in extreme cases, death.
- 11 b. There are no absolutes when it comes to irrigation. Check the plants for wilting in the afternoon.
- 12 Water thoroughly to runoff to remoisten entire soil profile if the plants show signs of wilting.
- 13 c. Shaded areas require less irrigation.
- 14
- 15 **F. Fall Maintenance (October to November)**
- 16
- 17 1. Conduct Biweekly Inspections, unless ice or frost is present.
- 18 2. Do Not Fertilize during the fall. It may stimulate tender growth and compromise the cold hardiness of
- 19 the plant material.
- 20 3. Do Not Water Period: For the northern temperate zone, it is recommended that maintenance
- 21 contractors do not water within 4 weeks of the expected average frost date. Normally, there is plenty
- 22 of moisture this time of year, and adding additional water may compromise the durability of the
- 23 plants to endure winter's cold. For this reason, watering during the winter is also not recommended.
- 24 4. Blow out irrigation system with compressed air no greater than 60 psi prior to reaching freezing
- 25 temperatures.
- 26 5. Rake, bag and remove fallen and matted leaves. These can smother the green roof plants.
- 27
- 28 **G. Winter Maintenance**
- 29
- 30 1. Northern Temperate Climates
- 31
- 32 a. Watering is not recommended.
- 33 b. Avoid walking on frozen plants and roof surfaces as they are slippery and dangerous.
- 34 c. If clear pathways are needed, avoid using salt and other deicing chemicals, which may kill plants
- 35 and damage pavers. Instead, use sand or cat litter as an anti-slip agents. Consider use of heat
- 36 strips with pavers, provided they can be applied without damage to the roofing membrane.
- 37 d. Avoid piling the snow in a single place. Disperse snow evenly over the green roof plantings as
- 38 excess snow piling can potentially damage plants by insulating the plants and keeping them warm
- 39 and wet, thereby triggering fungal diseases.
- 40
- 41 2. Warm Climates
- 42
- 43 a. Conduct Biweekly Inspections, unless ice or frost is present.
- 44

3.10 ACCEPTANCE

- 46 **A.** Conduct post installation inspection to determine acceptance of modules. Inspection to be made by General
- 47 Contractor's Representative or by Owner's Representative upon General Contractor's request; five working
- 48 days notice required.
- 49 **B.** Installer is responsible to complete requirements to obtain confirmation of warranty from the green roof
- 50 systems manufacturer.
- 51 **C.** Installer is responsible to ensure proper module/plant maintenance until work has been accepted by
- 52 representative of Owner or General Contractor.
- 53 **D.** Upon acceptance, Owner assumes responsibility for module/plant maintenance unless otherwise specified.
- 54

- 1 **3.11** CLEAN UP
- 2
- 3 **A.** Throughout installation, keep all work surfaces clean and free of grit, dirt, or debris. Use broom not blower, do
- 4 not sweep soil under modules or slip sheet. Do not place modules upon soil, dirt, stones or grit. Following
- 5 installation, remove all excess materials and tools from job site. Ensure that any damage that occurs as a result
- 6 of installation is appropriately and immediately repaired.

**SECTION 07 84 13
PENETRATION FIRESTOPPING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
 - c. Penetrations located in construction containing fire-protection-rated openings.
 - d. Penetrating items larger than 4-inch- (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.
 - 3. L-Rated Systems: Where through-penetration firestop systems are indicated in smoke barriers, provide through-penetration firestop systems with L-ratings indicated at both ambient temperatures and 400 deg F.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
- C. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.
- E. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems 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.

- 1 B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems
- 2 in Project to a single qualified installer.
- 3 C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction
- 4 condition indicated, from a single manufacturer.
- 5 D. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with
- 6 requirements and manufacturer's written recommendations.
- 7 E. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following
- 8 requirements and those specified in "Penetrating Firestopping" article:
- 9 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and
- 10 inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop
- 11 systems acceptable to authorities having jurisdiction.
- 12 2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems
- 13 bearing classification marking of qualified testing and inspecting agency.
- 14 F. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are
- 15 installed according to specified requirements.
- 16 G. Do not cover up through-penetration firestop system installations that will become concealed behind other
- 17 construction until each installation has been examined by Owner's inspecting agency and building inspector, if
- 18 required by authorities having jurisdiction.
- 19 H. Preinstallation Conference: Conduct conference at Project site.
- 20

21 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 22 A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages
- 23 with intact and legible manufacturers' labels, identifying product and manufacturer; date of manufacture; lot
- 24 number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project;
- 25 curing time; and mixing instructions for multicomponent materials.
- 26 B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to
- 27 moisture, temperature changes, contaminants, or other causes.
- 28

29 **1.6 PROJECT CONDITIONS**

- 30 A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate
- 31 temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates
- 32 are wet due to rain, frost, condensation, or other causes.
- 33 B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where
- 34 this is inadequate, forced-air circulation.
- 35

36 **1.7 COORDINATION**

- 37 A. Coordinate construction of opening and penetrating items to ensure that through-penetration firestop systems are
- 38 installed according to specified requirements.
- 39 B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration
- 40 firestop systems.
- 41

42 **PART 2 - PRODUCTS**

43 **2.1 MANUFACTURERS**

- 44 A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems
- 45 indicated for each application that are produced by one of the following manufacturers:
- 46 1. Grace, W. R. & Co.
- 47 2. Johns Manville.
- 48 3. 3M; Fire Protection Products Division.
- 49 4. USG Corporation.
- 50 5. Tremco, Inc.; Tremco Fire Protection Systems Group.
- 51 6. Approved equal.
- 52

53 **2.2 PENETRATION FIRESTOPPING**

- 54 A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements
- 55 indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction
- 56 penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming
- 57 openings, and with penetrating items, if any, as demonstrated by penetration firestopping system manufacturer
- 58 based on testing and field experience.

- 1 B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a
2 positive pressure differential of 0.01-inch wg.
3
- 4 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- 5 C. Penetrations in Horizontal Assemblies: Ratings determined per ASTM E 814 or UL 1479, based on testing at a
6 positive pressure differential of 0.01-inch wg.
7
- 8 1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
- 9 2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of construction penetrated except for
10 floor penetrations within the cavity of a wall.
- 11 D. Penetrations in Smoke Barriers: Provide penetration firestopping with rating determined by UL 1479.
12
- 13 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated
14 temperatures.
- 15 E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than
16 25 and 450, respectively, as determined per ASTM E 84.
- 17 F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC
18 content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
19
- 20 1. Sealants: 250 g/L.
- 21 2. Sealant Primers for Nonporous Substrates: 250 g/L.
- 22 3. Sealant Primers for Porous Substrates: 775 g/L.
- 23 G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and
24 product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile
25 Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 26 H. Accessories: Provide components for each through-penetration firestop system that are needed to install fill
27 materials and to maintain ratings required. Use only those components specified by penetration firestopping
28 manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
29

30 2.3 MIXING

- 31 A. For those products requiring mixing before application, comply with through-penetration firestop system
32 manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing
33 equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to
34 produce products of uniform quality with optimum performance characteristics for application indicated.
35

36 PART 3 - EXECUTION

37 3.1 EXAMINATION

- 39 A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening
40 configurations, penetrating items, substrates, and other conditions affecting performance of the work.
- 41 B. Proceed with installation only after unsatisfactory conditions have been corrected.
42

43 3.2 PREPARATION

- 44 A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply
45 with written recommendations of firestop system manufacturer and the following requirements:
46
- 47 1. Remove from surfaces of opening substrates and from penetrating items, foreign materials that could
48 interfere with adhesion of through-penetration firestop systems.
- 49 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing
50 optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning
51 operation.
- 52 3. Remove laitance and form-release agents from concrete.
- 53 B. Priming: Prime substrates where recommended in writing by through-penetration firestop manufacturer using that
54 manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and
55 migration onto exposed surfaces.
- 56 C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces
57 that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by

1 such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon
2 as possible without disturbing firestop system's seal with substrates.

3
4 **3.3 THROUGH PENETRATION FIRESTOPPING SYSTEM INSTALLATION**

- 5 A. General: Install through-penetration firestop systems to comply with "Penetrating Firestopping" Article and with
6 through- penetration firestopping system manufacturer's written installation instructions and published drawings for
7 products and applications indicated.
- 8 B. Install forming/damming/backing materials and other accessories of types required to support fill materials during
9 their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire
10 ratings indicated.
- 11 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other
12 accessories not indicated as permanent components of firestop systems.
- 13 C. Install fill materials for firestop systems by proven techniques to produce the following results:
- 14 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required
15 to achieve fire-resistance ratings indicated.
- 16 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- 17 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces
18 that are flush with adjoining finishes.
- 19 D. Identification: Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently
20 to surfaces adjacent to and within 6 inches of edge of the firestopping edge so that labels will be visible to anyone
21 seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with
22 adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following
23 information on labels:
- 24 1. The words "Warning – Penetration Firestopping – Do Not Disturb. Notify Building Management of Any
25 Damage."
26 2. Contractor's name, address, and phone number.
27 3. Designation of applicable testing and inspecting agency.
28 4. Date of installation.
29 5. Manufacturer's name.
30 6. Installer's name.

31
32 **3.4 FIELD QUALITY CONTROL**

- 33 A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect through-penetration
34 firestop systems and to prepare test reports. Independent inspecting agency shall comply with ASTM E 2174
35 requirements, including those related to qualifications, conducting inspections, and preparing test reports.
- 36
- 37 1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply
38 with or deviate from requirements.
- 39 B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace
40 through-penetration firestopping to comply with requirements.
- 41 C. Proceed with enclosing through- penetration firestop systems with other construction only after inspection reports
42 are issued and firestop installations comply with requirements.
- 43

44 **3.5 CLEANING AND PROTECTION**

- 45 A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that
46 are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in
47 which openings occur.
- 48 B. Provide final protection and maintain conditions during and after installation that ensure through-penetration
49 firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection,
50 damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems
51 immediately and install new materials to produce through-penetration firestop systems complying with specified
52 requirements.
- 53

54 **END OF SECTION 07 84 13**

SECTION 07 84 46
FIRE-RESISTIVE JOINT SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes fire-resistive joint systems for the following:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

1.2 PERFORMANCE REQUIREMENTS

- A. General: 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 assembly in which fire-resistive joint systems are installed.
- B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, and with movement capabilities and L-ratings indicated as determined by UL 2079.
1. Load-bearing capabilities as determined by evaluation during the time of test.
- C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.
1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.
- D. For fire-resistive systems exposed to view, provide products with flame-spread and smoke developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: For each fire-resistive joint system.
- C. Qualification Data: For Installer.
- D. Field quality-control test reports.
- E. Evaluation Reports: Evidence of fire-resistive joint systems' compliance with ICBO ES AC30, from the ICBO Evaluation Service.
- F. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program

- 1 Requirements.”
2
3 B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems
4 in Project to a single qualified installer.
5
6 C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements
7 and those specified in Part 1 "Performance Requirements" Article:
8
9 1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and
10 inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive
11 joint systems acceptable to authorities having jurisdiction.
12 2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance
13 Requirements" Article and comply with the following:
14
15 a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
16 b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the
17 qualified testing and inspecting agency.
18
19 D. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified
20 requirements.
21
22 E. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until
23 inspecting agency and building inspector of authorities having jurisdiction have examined each installation.
24
25

26 PART 2 – PRODUCTS

27 2.1 MANUFACTURERS

- 28
29 A. Manufacturers: Subject to compliance with requirements, provide products by one the following manufacturers:
30
31 1. A/D Fire Protection Systems Inc.
32 2. CEMCO.
33 3. Grace Construction Products.
34 4. Johns Manville.
35 5. 3M Fire Protection Products.
36 6. Tremco, Inc.; Tremco Fire Protection Systems Group.
37 7. USG Corporation.
38 8. Or approved equal.
39
40

41 2.2 FIRE-RESISTIVE JOINT SYSTEMS

- 42
43 A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according
44 to requirements indicated, resist passage of smoke and other gasses, and maintain original fire-resistance rating of
45 assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall
46 accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
47
48 B. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of
49 service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field
50 experience.
51
52 C. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are
53 needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components
54 specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for
55 systems indicated.
56

- 1 D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than
- 2 25 and 450, respectively, as determined per ASTM E 84.
- 3
- 4 E. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when
- 5 calculated according to 40 CFR 59, Subpart D (EPA 24):
- 6
- 7 1. Architectural Sealants: 250 g/L.
- 8 2. Sealant Primers for Nonporous Substrates: 250 g/L.
- 9 3. Sealant Primers for Porous Substrates: 775 g/L.

10

11

12 **PART 3 – EXECUTION**

13

14 **3.1 INSTALLATION**

15

- 16 A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations,
- 17 substrates, and other conditions affecting performance of the Work.
- 18
- 19 B. Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint
- 20 system manufacturer's written installation instructions for products and applications indicated.
- 21
- 22 C. Install forming materials and other accessories of types required to support fill materials during their application and
- 23 in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- 24
- 25 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other
- 26 accessories not indicated as permanent components of fire-resistive joint system.
- 27
- 28 D. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
- 29
- 30 1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance rating
- 31 indicated.
- 32 2. Apply fill materials so they contact and adhere to substrates formed by joints.
- 33 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces
- 34 that are flush with adjoining finishes.
- 35

36 **3.2 IDENTIFICATION**

37

- 38 A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces
- 39 adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint
- 40 system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels
- 41 to surfaces on which labels are placed. Include the following information on labels:
- 42
- 43 1. The words "Warning – Fire-Resistive Joint System – Do Not Disturb. Notify Building Management of Any
- 44 Damage."
- 45 2. Contractor's name, address, and phone number.
- 46 3. Designation of applicable testing agency.
- 47 4. Date of installation.
- 48 5. Manufacturer's name.
- 49 6. Installer's name.
- 50

51 **3.3 FIELD QUALITY CONTROL**

52

- 53 A. Inspecting Agency: Owner may engage a qualified testing agency to perform tests and inspections.
- 54
- 55 B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace
- 56 fire-resistive joint systems so they comply with requirements.
- 57

- 1 C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and
- 2 installations comply with requirements.
- 3

4

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes joint sealants for the following applications, including those specified by reference to this Section:
1. Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 2. Exterior joints in horizontal traffic surfaces.
 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 4. Interior joints in horizontal traffic surfaces.
 5. Acoustical joint sealants.
 6. Refer to Drawings and Joint Sealant Schedule at the end of this section for specific joint locations and sealant types.
- B. Related Sections:
1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- C. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
1. Product data including samples and manufacturer's surface preparation and installation instructions.
 - a. List of primers recommended for each application.
 2. Submit samples of each color required for each type of joint sealer exposed to view in duplicate.
 3. Certifications: Indicate compliance with standards specified in duplicate.
- B. Where required by local building codes, provide certification from sealant manufacturer that sealants used in conjunction with E.I.F.S. installations is in compliance with E.I.F.S. manufacturers requirements.
- C. Compliance and Adhesion Test Reports: From sealant manufacturer for the following:
1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
- D. Product Test Reports: From a qualified testing agency indicating sealants comply with requirement, based on comprehensive testing of current production formulations.
- E. Warranties: Special warranties listed in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

1 B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

2
3 C. Preinstallation Conference: Conduct conference at Project site.

4
5 **1.5 DELIVERY, STORAGE, AND HANDLING**

6
7 A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer,
8 product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-
9 component materials.

10
11 B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration
12 or damage due to moisture, high or low temperatures, contaminants, or other causes.

13
14 **1.6 PROJECT CONDITIONS**

15
16 A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

- 17
18 1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant
19 manufacturer or are below 40 degrees F. and less than 100 degrees F.
20 2. When joint substrates are wet.

21
22 B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those
23 allowed by joint sealant manufacturer for applications indicated.

24
25 C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of
26 interfering with adhesion are removed from joint substrates.

27
28 **1.7 WARRANTY**

29
30 A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint
31 sealants that do not comply with performance or other requirements specified in this Section within specified
32 warranty period.

- 33 1. Warranty Period: Two (2) years from date of Substantial Completion.

34
35 B. Special Manufacturer's Warranty:

- 36 1. Submit two copies of a written guarantee agreeing to repair or replace joint sealers which fail to perform as
37 air tight and water-tight joints; or fail in joint adhesion, cohesion, abrasion resistance weather resistance, or
38 general durability; or appear to deteriorate or become unserviceable or causing an objectionable appearance
39 resulting from either defective or non-conforming materials and workmanship or in any other manner not
40 clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure
41 indicated. Provide two-year warranty from date of Substantial Completion.

42 a. Defects shall include, but are not limited to:

- 43 a. Staining from abutting materials or filler.
44 b. Migrating, bleeding into, or staining abutting materials.
45 c. Unsightly surface deformation by causes other than movement.
46 d. Excessive color change, chalking, or dust pick-up.
47 e. Railing adhesively or cohesively where maximum elongation is less than 25% of designed width
48 of exposed joints.
49 f. Hardening to more than 25% over specified hardness.

50 b. Replace sealants which fail because of loss of cohesion or adhesion or do not cure.

51
52 **1.8 EXTRA MATERIALS**

53 A. Furnish extra sealant materials from same production run as the materials applied in the quantities described
54 below. Package materials in unopened, factory-sealed containers with labels describing contents.

- 55 1. Quantity: Furnish one unused tube of each type and color of exterior sealant applied.

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PART 2 PRODUCTS

2.1 SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Suitability for Immersion in Liquids: Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Colors of Exposed Joint Sealants: Sealant, generally, shall be the color of the adjacent material which lies in the same plane as the sealant. Verify all colors with Architect prior to installation.
- E. Elastomeric Sealant Standard: ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant, including those referencing ASTM C920 classifications for type, grade, class, and uses.
- F. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.
- G. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 JOINT SEALANTS

- A. Sanitary Sealant, Interior Use: One component silicone rubber sealant.
 - 1. ASTM C920, Type S, Grade NT, Class 25, and FS-TT-S-1543B, Class A.
 - 2. Provide acid cure, nonporous bond type, mildew resistant silicone rubber where both joint faces are metal, glass, plastic, tile, or other non-porous material.
- B. Interior Joints Not Subject to Movement: One part, gun grade, acrylic latex.
 - 1. ASTM C834, Type OP, Grade NF, with 10 year life expectancy.
- C. Interior Joints subject to Movement: Single-component, Nonsag, Urethane Joint Sealant.
 - 1. ASTM C 920, Type S, Grade NS, Class 25, for Use NT and FS-TT-S230 with 20-year life expectancy.
- D. Exterior joints greater than 1/2": Multicomponent, Nonsag, Urethane Joint Sealant:
 - 1. ASTM C920, Type M, Grade NS, Class 50, for Use NT with 20 year life expectancy.

- 1
2
3 E. Exterior joints less than 1/2": Single component, Nonsag, Urethane Joint Sealant:
4 1. ASTM C920, Type S, Grade NS, Class 25, for Use NT with 20-year life expectancy.
5
6 F. Sealant Materials – Acoustical Sealant: Manufacturer’s standard nonsag, paintable, nonstaining latex sealant
7 complying with ASTM C919. Product effectively reduces airborne sound transmission through perimeter joints and
8 openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
9
10 1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59,
11 Subpart D (EPA Method 24).
12
13 G. Sealant Materials - Glazing: composition shall be a silicone base, single component, solvent curing, capable of
14 withstanding movement of up to 50 percent of joint width and shore a hardness of 26.
15
16 1. ASTM C920, TTS-S-001543A and TT-S-00230C (COM-NBS).
17

18 **2.3 ACCESSORIES**

- 19
20 A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
21
22 B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint
23 forming materials.
24
25 C. Joint Filler Backer Rod: ASTM D1056; D1565; round, closed cell polyethylene, non-gassing rod sized to produce 25%
26 compression when installed in joint.
27
28 D. Cleaners for Nonporous Surfaces: Provide nonstaining, chemical cleaners of type which are acceptable to
29 manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent
30 nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant
31 adhesion or in-service performance.
32
33 1. Provide cleaner conditioner required for glass and glazed surfaces as recommended by sealant manufacturer.
34
35 E. Masking Tape: Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to
36 joints.
37
38

39 **PART 3 EXECUTION**

40
41 **3.1 EXAMINATION**

- 42
43 A. Examine joints indicated to receive joint sealers, with Installer present, for compliance with requirements for joint
44 configuration, installation tolerances and other conditions affecting joint sealer performance.
45
46 B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of Installation means
47 acceptance of all existing conditions making this Contractor responsible for correcting all unsatisfactory and
48 defective work encountered at his expense.
49

50 **3.2 PREPARATION**

- 51
52 A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with
53 recommendations of joint sealer manufacturers and the following requirements:
54
55 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealant,
56 including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion

- 1 and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents;
2 water; surface dirt; and frost.
- 3 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by
4 brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a
5 clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles
6 remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
7 Remove laitance and form release agents from concrete.
- 8 3. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave
9 residues capable of interfering with adhesion of joint sealants.
- 10
- 11 B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based
12 on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer
13 manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration
14 onto adjoining surfaces.
- 15
- 16 C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which
17 otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove
18 sealant smears such as masonry. Remove tape immediately after tooling without disturbing joint seal.
- 19

20 3.3 INSTALLATION OF JOINT SEALERS

- 21
- 22 A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and
23 applications indicated, except where more stringent requirements apply. Surfaces and air temperature shall be
24 greater than 30 degrees F and less than 100 degrees F.
- 25
- 26 B. Sealant Installation Standard: Comply with requirements in ASTM C1193 for use of joint sealants as applicable to
27 materials, applications, and conditions indicated.
- 28
- 29 C. Acoustical Sealant Installation Standard: Comply with recommendations in ASTM C919 for use of joint sealants in
30 acoustical applications as applicable to materials, applications, and conditions indicated.
- 31
- 32 D. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on
33 reconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant
34 manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or
35 migration onto adjoining surfaces.
- 36
- 37 1. Ensure that primer fully covers surfaces to which sealant is to adhere.
- 38 2. Apply with bristle brush. Do not flood surfaces.
- 39 3. Allow primer to dry 30 minutes minimum or as recommended by manufacturer prior to application of backing
40 rod and sealant.
- 41
- 42 E. Install sealant backings of type indicated to support sealants during application and at position required to produce
43 cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant
44 movement capability.
- 45
- 46 1. Do not leave gaps between ends of sealant backings.
- 47 2. Do not stretch, twist, puncture, or tear sealant backings.
- 48 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with
49 dry materials.
- 50
- 51 F. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of
52 sealant to surfaces at back of joints would result in sealant failure. Bond breaker must be used in all conditions
53 where three-sided adhesion may be possible.
- 54
- 55 G. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
- 56

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses provided for each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
4. Joint Size:
 - a. Depth of joint shall not exceed width of joint.
 - b. Minimum depth: ¼"
 - c. Maximum depth: ½"

H. Installation of Preformed Silicone-Sealant System: Comply with manufacturer's written instructions.

I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

J. Acoustical Sealant Installation: Comply with ASTM C919 and with manufacturer's written recommendations.

K. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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 sealants from surfaces adjacent to joint.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - a. Provide concave joint configuration per Figure 5A in ASTM C1193, unless otherwise indicated.
 - b. Provide flush joint configuration, per Figure 5B in ASTM C1193, where indicated.
 - c. Provide recessed joint configuration, per Figure 5C in ASTM C1193, of recess depth and at locations indicated.
 - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.
 - b. All joints shall be free of air pockets, foreign embedded matter, ridges, and sags.

3.4 CURE

A. Cure sealant in compliance with manufacturer's instructions and recommendations to obtain high, early bond strength, internal cohesion strength and surface durability.

3.5 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur. Remove masking material immediately following sealant application.

3.6 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

- 1 B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or
2 noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to
3 adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until
4 test results prove sealants comply with indicated requirements.
5

6 3.7 PROTECTION

7

- 8 A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage
9 resulting from construction operations or other causes so that they are without deterioration or damage at time of
10 Substantial Completion. If, despite such protection, damage and deterioration occurs, cut out and remove
11 damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer
12 installations with repaired areas indistinguishable from original work.
13

14 3.8 SEALANT SCHEDULE

- 15 A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
- 16 1. Joint Locations:
17 a. Isolation and contraction joints in cast-in-place concrete slabs.
18 b. Other joints as indicated.
19 2. Joint Sealant: Urethane.
20 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
21
- 22 B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
- 23 1. Joint Locations:
24 a. Construction joints in cast-in-place concrete.
25 b. Joints between plant-precast architectural concrete units.
26 c. Control and expansion joints in unit masonry.
27 d. Joints in exterior insulation and finish systems.
28 e. Joints between metal panels where indicated.
29 f. Joints between different materials listed above.
30 g. Perimeter joints between materials listed above and frames of doors, windows and louvers.
31 h. Control and expansion joints in ceilings, soffits and other overhead surfaces.
32 i. Other joints as indicated.
33 2. Joint Sealant: Elastomeric.
34 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
35
36
- 37 C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
- 38 1. Joint Locations:
39 a. Isolation joints in cast-in-place concrete slabs.
40 b. Control and expansion joints in tile flooring.
41 c. Other joints as indicated.
42
- 43 2. Joint Sealant: Urethane.
44 3. Joint Sealant Color: As selected by Architect from manufacturer's full range of colors.
45
- 46 D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
- 47 1. Joint Locations:
48 a. Control and expansion joints on exposed interior surfaces of exterior walls.
49 b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.

- 1 d. Vertical joints (non-fire-rated) on exposed surfaces of interior unit masonry and concrete walls and
 2 partitions.
- 3 e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator
 4 entrances.
- 5 f. Other joints as indicated.
- 6 2. Joint Sealant: Latex.
- 7 3. Joint-Sealant Color: As selected by Architect from manufacturer’s full range of colors.
- 8 E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
- 9 1. Joint Sealant Location:
- 10 a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- 11 b. Tile control and expansion joints where indicated.
- 12 c. Other joints as indicated.
- 13 2. Joint Sealant: Silicone.
- 14 3. Joint Sealant Color: As selected by Architect from manufacturer’s full range of colors.
- 15 F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
- 16 1. Joint Sealant Location:
- 17 a. Acoustical joints where indicated.
- 18 2. Joint Sealant: Acoustical.
- 19 3. Joint Sealant Color: As selected by Architect from manufacturer’s full range of colors.
- 20
- 21
- 22 G. Work shall include providing sealant at the intersection of construction components of the interior and exterior of
 23 the building, including, but not limited to the following conditions:
 24

1.	Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
	Control and expansion joints in cast-in-place concrete
	Joints between architectural precast concrete units
	Control and expansion joints in unit masonry
	Joints between metal panels
	Joints between different materials listed above
	Perimeter joints between materials listed above and frames of doors and windows
	Control and expansion joints in ceiling and overhead surfaces
	Under thresholds
	Refrigerant lines and other Div. 21 through 28 items entering building
	Joints in coping caps and exposed roof counter flashing
	Other joints as indicated
2.	Exterior joints in the following horizontal traffic surfaces:
	Control, expansion, and isolation joints in cast-in-place concrete slabs
	Tile control and expansion joints
	Joints between different materials listed above
	Other joints as indicated
3.	Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
	Control and expansion joints on exposed interior surfaces of exterior walls.
	Perimeter joints of exterior openings where indicated
	Tile control and expansion joints.

	Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions
	Joints on underside of precast beams and planks
	Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances
	Joints between plumbing fixtures and adjoining walls, floors, and counters
	Edge of all vinyl wallcovering installations at junctions with other materials, including ceiling joint
	Bottom edge of mirror channels
	Top of tub surround
4.	Interior joints in the following horizontal traffic surfaces
	Control and expansion joints in cast-in-place concrete slabs
	Control and expansion joints in tile flooring
	Joints at countertops, vanities
	Under thresholds except marble
	Door bucks not flush with thresholds
	Tubs, lavatories, water closets, and other plumbing fixtures
	Perimeters of fixed kitchen equipment
	Joints of mirrors in wet areas
	Other joints as indicated

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END OF SECTION

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**SECTION 07 95 00
EXPANSION JOINT CONTROL SYSTEMS**

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes:
- B. Scope of Work
 - 1. Interior expansion control systems
 - 2. Exterior expansion control systems
 - 3. Expansion Joint accessories including provisions for fire rated assemblies, moisture barriers, waterproofing, acoustic and thermal measures.
- C. Provide all labor, materials and services to perform operations in connection with furnishing, delivery, and installation of work related to this section.

1.2 REFERENCES

- A. Work shall be performed following applicable Local, State, and Federal codes and regulations.
- B. Publications listed herein are part of this specification. See below for standards where applicable to the product listed:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM B221, "Standard Specifications for Aluminum and Aluminum-Alloy Extrusions."
 - b. ASTM B209, "Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
 - c. ASTM E1399 "Cyclic Movement and Measuring of Minimum/Maximum Joint Widths of Architectural Joint Systems."
 - d. ANSI/U.L. No. 263, UL2079 and ULCS115 Fire Rated Testing including hose stream test at full rated period. Underwriter's Laboratories shall classify adjacent substrate assemblies.
 - e. ASTM E1612, Standard Specification for Preformed Architectural Compression Seals for Buildings and Parking Structures.
 - f. EN 1366-4 and BS 476 part 20 compliant fire rated linear expansion joints.

1.3 DEFINITIONS

- A. Product Movement capabilities
 - 1. Product operating range defined as a percentage of the nominal joint width.
 - 2. Industry standard requirements: 25%+- operating range for thermal conditions. 50%+- operating range for seismic and windway conditions.

1.4 SYSTEM DESCRIPTION

- A. Joint coverplate systems shall permit daily thermal expansion and contraction of building elements, minor foundation settlement, and common windway movements of the structure without disengagement.
 - 1. Joint system details shall clearly indicate X-axis joint movement capabilities (horizontal contraction/expansion). Y-axis joint movement (in-plane shear), and Z- axis movement (vertical shear) may be requested of the Manufacturer if applicable.
 - 2. Movement capabilities shall be clearly defined as a percentage of the nominal joint width or with distinct dimensions defined on product details.
- B. Joint Systems shall allow for seismic movement (if applicable), matching requirements as defined within the Project Specific Structural Specifications.

1 C. Fire Rated Assemblies shall be tested by registered Third Party Testing Agencies in accordance with
2 UL2079, ULC S115, or BS 476 classified systems. Expansion joint assembly fire rating shall match or exceed
3 the fire rating of adjacent construction.
4

5 **1.5 QUALITY ASSURANCE**
6

- 7 A. Architectural Joint Cover Manufacturer: Furnish horizontal and vertical systems from a Manufacturer with a minimum
8 of ten (10) years of experience in the design, engineering and fabrication of expansion joint systems.
9
10 B. Fire Rated Assembly Manufacturer: Furnish horizontal and vertical rated systems from a single
11 Manufacturer to ensure compatibility. Intersection of/ or transition between dissimilar systems is not
12 allowed unless reviewed and approved by AHJ.
13 C. Installer: Contractor with not less than three (3) years of successful experience in the installation of systems
14 similar to those required by Project.
15

16 **1.6 ACTION SUBMITTALS**
17

- 18 A. Manufacturer's Specifications, technical data, installation instructions, and detail drawings for each proposed
19 system.
20
21 B. Listings/ Certifications of all Fire Rated Assemblies secured through registered thirdparty testing agency.
22
23 C. Representative sample of specified systems 4" minimum length.
24
25

26 **1.7 DELIVERY AND STORAGE**
27

- 28 A. Manufacturer to provide protective film on all exposed cover plate components.
29
30 B. Deliver joint systems to jobsite in new, clean, unopened cartons or crates of sufficient size and strength to protect
31 materials during transit.
32
33 C. Inspect materials upon arrival. Store components in original containers in a clean, dry location. Ensure
34 temperature or moisture sensitive components are stored in a tempered location.
35
36 D. Contractor to provide temporary protective covers on all installed finished surfaces. Protection is required to
37 guard against both surface abrasions as well as overloading of horizontal deck components by construction
38 traffic.
39

40 **1.08 SEQUENCING**
41

- 42 A. Submittals shall be completed and remitted to the Project Architect within 4 weeks after award of subcontract.
43
44 B. Subcontract for the work of this section shall be planned to allow sufficient time for Manufacturer's
45 production and delivery scheduling.
46

47 **1.09 WARRANTY**
48

- 49 A. Standard JointMaster/InPro Corporation limited warranty against material and manufacturing defects for a period of
50 not less than five (5) years when installed in accordance with Manufacturer's recommendations.
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PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer must be capable of providing a full range interior and exterior architectural joint cover systems as well as a full complement of expansion joint accessories.
- B. Manufacturer must be capable of providing project specific details accurate to the building construction type.
- C. Substitutions: Requests for substitutions must be preapproved by Architect.

2.2 MATERIALS

- A. Aluminum: Alloy types of 6061-T6, 6063-T6, 6005A, or 5052-H32 sheet goods.
 - 1. Walls and Ceilings: Finish as selected by Architect.
- B. Stainless Steel: Alloy Type 304 for plates and strips.
 - 1. Brushed #4 surface finish standard
- C. Elastomeric Seals: Synthetic rubber seals comprised of a dual extrusion Santoprene rubber for heat welding of all transitions and seams for a monolithic, weathertight installation. EPDM and Neoprene substitutions are not allowed due to their lack of ability to meet this specific requirement.
 - 1. All Santoprene seals must be certified as low VOC.
- D. Horizontal and Vertical Moisture Barrier: Min. 45 mil thick fabric reinforced EPDM with optional watertight drain assemblies.
- E. Horizontal and Vertical Insulated Vapor Barrier:
 - 1. Min. R Value of 15
 - 2. Must meet ASTM E1399 Cyclic movement requirements matching movement requirements specific to project.

2.3 INTERIOR WALL AND CEILING JOINT SYSTEMS

- A. Standard Surface Mount Coverplate
 - 1. Surface mounted profiles mechanically fastened to a single side of the expansion joint opening.
 - 2. Standard Nominal Joint applications 2-6" [50-150mm]
 - 3. Joint operating range 50%+- of total nominal joint width
 - 4. New and existing construction applications.
 - 5. Clear Anodized Class II Anodized Finish
 - 6. Surface Mount system 811 Series

2.4 EXTERIOR VERTICAL WALL JOINT SYSTEMS

- A. Vertical Open Cell Silicone Faced Water-Resistant Foam
 - 1. Standard Joint range applications 2-12" [50-300mm]
 - 2. Joint operating range 50%+- of total nominal joint width
 - 3. Pre-compressed open micro-cell polyurethane foam impregnated with a polymer sealing compound (2% wax content required for optimal hydrophobic qualities). Manufactured of monolithic piece of non-laminated, open cell, high density (1.5lb/sqft min.) The foam sealant shall have a fully cured, modified silicone rubber top coat, factory applied when the material is fully expanded. The sealant shall be provided in a pre-compressed state. Bonding Adhesive the adhesive shall be waterproof epoxy adhesive that is compatible with concrete and steel as recommended by the manufacturer. Splice Adhesive the splice adhesive may be any polyurethane adhesive recommended by the manufacturer of the foam sealant.

PROPERTY	TEST METHOD	REQUIREMENTS
Tensile Strength	ASTM D3574	meets 212 psi min.
Staining and bleeding	DIN 18 542	Meets requirements
Elongation, Ultimate	ASTM D3574	150% min.
Resistance to UV & Moisture	DIN 18 542	Meets requirements
Density		10lb/cu.ft.
Compression Set	ASTM D3574	3% max.
Flammability	UL 94VO	Self Extinguishing

Low Temperature Flexibility	ASTM C711	No Cracking or Splitting 32°F to 0° F
Water Resistance	ASTM E 331	12 psf min

- 4. Surface coated with a colorized, elastomeric layer of silicone in (26) standard color options
- 5. Recessed/ Flush system 1200 Series

2.5 EXTERIOR ROOF JOINT SYSTEMS

- A. Roof Expansion Joint Bellows System
 - 1. Standard Joint range applications 2-18"
 - 2. Joint operating range 50%+- of total nominal joint width
 - 3. Flexible bellow combination of a flexible rubber membrane, supported by a closed cell foam to form flexible bellows, with two metal flanges, adhesively and mechanically combined to the bellows
 - a. Bellows: 0.060 in. thick non-reinforced EPDM bellows adhered and mechanically combined to metal flanges by bifurcation process.
 - b. Bellow Supports: Closed cell foam, 3/8 in. minimum thickness.
 - c. Flange Metal: Hot dipped Galvanized, Stainless Steel, Aluminum, or Copper.
 - d. Provide matching factory-fabricated corners, transitions, intersections and terminations.
- 4. 674 Series

2.6 ACCESSORY SYSTEMS

- A. Fire Rated Barriers and Blanket Systems
 - 1. Rated Fire Barrier system options ranging from 1-4 Hour Rating requirements with options meeting the following requirements:
 - 2. Tested by Accredited Third Party Architectural Testing and Listing Agency in accordance with ASTM E814/E119/E1966, UL 2079, EN 1366-4, BS 476 part 20 at its full rated period.
- B. Moisture Barrier for vertical and horizontal applications
 - 1. Reinforced EPDM 45 mil thick membrane with nylon mesh reinforcement. Optional drain fittings available in .375" and 1" inside diameter. On center spacing of drains to be determined by Plumbing Engineer of Record. Seams and directional transitions designed to ensure watertight seal and positive condensation drainage.
- C. Insulated Thermal Moisture Barrier for vertical and horizontal applications
 - 1. Reinforced EPDM 45 mil thk membranes sandwiching commercial grade batt insulation adhered and pinned together to resist slump and cyclic movement matching the capabilities of the specified coverplate systems. Maintain min. R-15 value. Seams and directional transitions designed to ensure watertight seal and positive condensation drainage.
- D. Waterproof Foam Seal (installed below coverplate system):
 - 1. Horizontal or Vertical Closed Cell Waterproof Foam:
 - a. Standard Joint range applications 2-18" [50-450mm]
 - b. Joint operating range 50%+- of total nominal joint width
 - c. Pre-formed, closed cell, crosslinked EVA copolymer polyethylene material. Low density, impermeable, ethylene vinyl acetate or nitrogen blown polyethylene foam installed in compression. Fastened with 2 part epoxy
 - d. PROPERTY REQUIREMENTS TEST METHOD

Tensile Strength	ASTM D3575	120 psi
Resistance to UV & Moisture	DIN18 542	Meets requirements
Density	ASTM D3575	15pdf @ 50%
3.0 pcf Compression Strength	ASTM D3575	9% @ 24 Hr.
Compression Set	ASTM D3575	9% @ 24 Hr.
Recovery Water Resistance	ASTM D3575	<.03 psf
 - C. Heatwelded miters and seams required for monolithic water protection.

2.7 FABRICATION

- A. Field assemble components provided in standard lengths with pre-packaged fasteners and accessories whenever possible.

- 1 B. Fabricate special transitions and corner fittings as required. Miter and heat weld elastomeric seals for monolithic
2 splices and transitions.
3
4

5 **PART 3 – EXECUTION**
6

7 **3.1 INSPECTION**

- 8 A. Prior to starting work, verify that structural gap and blockout dimensions are in conformance with manufacturer's
9 submittal data. Do not begin work until all unsatisfactory substrate conditions are resolved. See manufacturer for
10 recommended tolerances.
11 B. Carefully inspect installed work of other Trades and verify that such work is complete to allow the work of this
12 section to commence.
13 C. Schedule inspection of all Waterproofing measures and Fire Rated life safety product prior to installation of coverplate
14 systems –or- provide allowance for removal of 10% of coverplate systems for inspection before final acceptance.
15
16

17 **3.2 INSTALLATION**

- 18 A. Joint systems: Install in accordance with manufacturer's instructions.
19 B. Align work plumb, level and flush with adjacent surfaces. Mechanically anchor to substrate. Allowances should be
20 made where actual structural gap at time of installation varies from nominal design gap. No shimming of frames is
21 permitted.
22 C. Coordinate with work of other Sections.
23 D. If concrete blockouts (rebates) are required, ensure continuous support equal to surrounding substrate structural
24 values.
25 E. Fire Rated Assemblies: Where required, install to manufacturer's instructions.
26 F. Moisture Barrier: Where required, install to manufacturer's instructions.
27

28 **3.3 PROTECTION AND CLEANING**

- 29 A. Protect the completed Expansion Control system work from damage during construction. Damage protection
30 includes surface abrasion and overloading of coverplate by materials handling equipment and construction
31 waste/debris.
32 B. Protection from environmental factors required throughout installation process until Project Closeout. Protection
33 includes but is not limited to rain events, moisture protection, exposure to temperature fluctuations or direct sunlight
34 for temperature sensitive product offerings.
35 C. Prior to project closeout, clean all exposed surfaces with a suitable cleaner. Manufacturer suggests Xylene for
36 Santoprene seals, ensure non-solvent cleansers are not utilized throughout product lifespan.
37
38

END OF SECTION

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**SECTION 081113
HOLLOW METAL DOORS AND FRAMES**

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3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Interior standard steel doors and frames.
- 7 2. Exterior standard steel doors and frames.
- 8 B. Related Requirements:
- 9 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

10 **1.2 COORDINATION**

- 11 A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and
12 directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with
13 integral anchors. Deliver such items to Project site in time for installation.
- 14 B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control
15 and security systems.

16 **1.3 ACTION SUBMITTALS**

- 17 A. Product Data:
- 18 1. Interior standard steel doors and frames.
- 19 2. Exterior standard steel doors and frames.
- 20 B. Product Data Submittals: For each product.
- 21 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and
22 finishes.
- 23 C. Sustainable Design Submittals:
- 24 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content
25 and cost.
- 26 2. Environmental Product Declaration: For each product.
- 27 3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

28 **1.4 QUALITY ASSURANCE**

- 29 A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door
30 assemblies is to meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
- 31 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- 32 B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door
33 assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
- 34 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

35 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 36 A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit

- 1 and Project-site storage. Do not use nonvented plastic.
- 2 1. Provide additional protection to prevent damage to factory-finished units.
- 3 B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs
- 4 and mullions.
- 5 C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum
- 6 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air
- 7 circulation.

8 **PART 2 - PRODUCTS**

9 **2.1 HOLLOW METAL DOORS AND FRAMES**

- 10 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 11 1. Ceco Door; AADG, Inc.; ASSA ABLOY
- 12 2. Curries, AADG, Inc.; ASSA ABLOY Group
- 13 3. DCI Hollow Metal on Demand
- 14 4. MPI Group, LLC (The)
- 15 5. Or approved equal.

16 **2.2 PERFORMANCE REQUIREMENTS**

- 17 A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified
- 18 testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on
- 19 Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
- 20 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a
- 21 qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance
- 22 with UL 1784 and installed in compliance with NFPA 105.
- 23 B. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.40 deg Btu/F
- 24 x h x sq. ft. when tested in accordance with ASTM C1363 or ASTM E1423.
- 25 C. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) Per Section
- 26 014350, Part 3.1.B.3.i).
- 27 D. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior
- 28 Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference

29 **2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES**

- 30 A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication,
- 31 hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- 32 B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in
- 33 the Door and Frame Schedule on Drawings.
- 34 1. Doors:
- 35 a. Type: As indicated in the Door and Frame Schedule on Drawings.
- 36 b. Thickness: 1-3/4 inches.
- 37 c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
- 38 d. Edge Construction: Model 2, Seamless.
- 39 e. Edge Bevel: Bevel lock edge 1/8 inch in 2 inches.
- 40 f. Core: Manufacturer's standard.
- 41 g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and
- 42 temperature-rise-rated doors.

- 1 2. Frames:
- 2 a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
- 3 b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door
- 4 frame.
- 5 c. Construction: [Knocked down] [Slip-on drywall] [Face welded] [Full profile welded].
- 6 3. Exposed Finish: Prime.

7 **2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES**

- 8 A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication,
- 9 hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- 10 B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. At locations indicated in
- 11 the Door and Frame Schedule on Drawings.
- 12 1. Doors:
- 13 a. Type: As indicated in the Door and Frame Schedule on Drawings.
- 14 b. Thickness: 1-3/4 inches.
- 15 c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A60
- 16 coating.
- 17 d. Edge Construction: Model 2, Seamless.
- 18 e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
- 19 f. Top Edge Closures: Close top edges of doors with flush closures of same material as face
- 20 sheets. Seal joints against water penetration.
- 21 g. Bottom Edges: Close bottom edges of doors where required for attachment of weather
- 22 stripping with end closures or channels of same material as face sheets. Provide weep-hole
- 23 openings in bottoms of exterior doors to permit moisture to escape.
- 24 h. Core: Manufacturer's standard.
- 25 2. Frames:
- 26 a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60
- 27 coating.
- 28 b. Construction: .
- 29 3. Exposed Finish: Prime.

30 **2.5 BORROWED LITES**

- 31 A. Fabricate of uncoated steel sheet, minimum thickness of 0.042 inch.
- 32 B. Construction: [Knock-down] [Welded]
- 33 C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where
- 34 frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles
- 35 at each joint, fabricated of metal of same or greater thickness as metal as frames.
- 36 D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise
- 37 indicated.

38 **2.6 FRAME ANCHORS**

- 39 A. Jamb Anchors:
- 40 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and
- 41 suitable for performance level indicated.
- 42 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor
- 43 anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
- 44 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or

- 1 inserts, with manufacturer's standard pipe spacer.
- 2 B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- 3 C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips,
- 4 allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- 5 D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
- 6 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM
- 7 A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

8 **2.7 MATERIALS**

- 9 A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed
- 10 applications.
- 11 B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- 12 C. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- 13 D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated,
- 14 fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-
- 15 metal frames of type indicated.
- 16 E. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers
- 17 manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25
- 18 and 50, respectively; passing ASTM E136 for combustion characteristics.
- 19 F. Glazing: Comply with requirements in Section 088000 "Glazing."

20 **2.8 FABRICATION**

- 21 A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for
- 22 fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which
- 23 astragal is mounted or as required to comply with published listing of qualified testing agency.
- 24 B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require
- 25 multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint,
- 26 fabricated of metal of same or greater thickness as frames.
- 27 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or
- 28 joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by
- 29 welding.
- 30 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless
- 31 otherwise indicated.
- 32 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows.
- 33 Keep holes clear during construction.
- 34 a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- 35 b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- 36 C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised
- 37 hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in
- 38 accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
- 39 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door
- 40 hardware.
- 41 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- 42 D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and
- 43 moldings with butted, or, mitered hairline joints.
- 44 1. Provide stops and moldings flush with face of door, and with square stops unless otherwise

- 1 indicated.
- 2 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is
- 3 capable of being removed independently.
- 4 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
- 5 Provide loose stops and moldings on inside of hollow-metal doors and frames.
- 6 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types
- 7 indicated.
- 8 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly
- 9 not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

10 **2.9 STEEL FINISHES**

- 11 A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
- 12 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with
- 13 ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate
- 14 and field-applied coatings despite prolonged exposure.

15 **PART 3 - EXECUTION**

16 **3.1 PREPARATION**

- 17 A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and
- 18 dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up
- 19 factory-applied finishes where spreaders are removed.
- 20 B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

21 **3.2 INSTALLATION**

- 22 A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place.
- 23 Comply with approved Shop Drawings and with manufacturer's written instructions.
- 24 B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.
- 25 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors
- 26 are set. After wall construction is complete, remove temporary braces without damage to
- 27 completed Work.
- 28 a. Where frames are fabricated in sections, field splice at approved locations by welding face
- 29 joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed
- 30 faces. Touch-up finishes.
- 31 b. Install frames with removable stops located on secure side of opening.
- 32 2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
- 33 3. Floor Anchors: Secure with postinstalled expansion anchors.
- 34 a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion
- 35 anchors if so indicated and approved on Shop Drawings.
- 36 4. Solidly pack mineral-fiber insulation inside frames.
- 37 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames
- 38 and masonry with grout or mortar.
- 39 6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
- 40 a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from
- 41 jamb perpendicular to frame head.
- 42 b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane
- 43 of wall.

- 1 c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines,
- 2 and perpendicular to plane of wall.
- 3 d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- 4 C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified
- 5 below.
- 6 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
- 7 2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
- 8 3. Smoke-Control Doors: Install doors in accordance with NFPA 105.
- 9 D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal
- 10 manufacturer's written instructions.

11 **3.3 FIELD QUALITY CONTROL**

- 12 A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.
- 13 B. Inspections:
 - 14 1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 15 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with
 - 16 fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door,
 - 17 and each door equipped with special locking arrangements in accordance with NFPA 101, Section
 - 18 7.2.1.15.
 - 19 3. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) Per
 - 20 Section 014350, Part 3.1.B.3.i).
 - 21 a. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of
 - 22 testing total), performing out of sequence work as required to facilitate testing schedule.
 - 23 b. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8
 - 24 total, or all openings of a given type, if less than 8 of that type are present), as directed by
 - 25 Owner, BCxP, and Architect.
 - 26 c. Pass Criteria:
 - 27 1) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure
 - 28 4. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed
 - 29 Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure
 - 30 Difference.
 - 31 a. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of
 - 32 testing total), performing out of sequence work as required to facilitate testing schedule.
 - 33 b. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8
 - 34 total, or all openings of a given type, if less than 8 of that type are present), as directed by
 - 35 Owner, BCxP, and Architect.
 - 36 c. Pass Criteria:
 - 37 1) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure
- 38 C. Repair or remove and replace installations where inspections indicate that they do not comply with
- 39 specified requirements.
- 40 D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly
- 41 installations comply with specified requirements.
- 42 E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance
- 43 with each item listed in NFPA 80, NFPA 101.

44 **3.4 REPAIR**

- 45 A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and
- 46 apply touchup of compatible air-drying, rust-inhibitive primer.

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**SECTION 08 31 13
ACCESS DOORS AND FRAMES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes access doors and frames for walls and ceilings.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For door face material.
- D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
 - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for door panels needed to gain access to concealed plumbing, mechanical, or other concealed work.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
 - 2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
- C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- E. Frame Anchors: Same type as door face.
- F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153 M or ASTM F 2329.
- G. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Baked-Enamel Finish: Minimum dry film thickness of 2 mils.
- H. Drywall Beads: 0.0299-inch zinc-coated steel sheet to receive joint compound.
- I. Plaster Beads: 0.0299-inch zinc-coated steel sheet with flange of expanded metal lath.
- J. Manufacturer's standard finish.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Access Panel Solutions.
 - 2. Babcock-Davis; A Cierra Products Co.
 - 3. Jensen Industries.
 - 4. J. L. Industries, Inc.
 - 5. Milcor Inc.
 - 6. Nystrom, Inc.
 - 7. Williams Bros. Corporation of America (The).

- 1 8. Or approved equal.
- 2 B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- 3 C. All access doors and frames must be rated, at a minimum, the same as the assembly that they penetrate.
- 4 D. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.
 - 5 1. Locations: Wall and ceiling surfaces.
 - 6 2. Door: Minimum 0.060-inch-thick sheet metal.
 - 7 3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead flange.
 - 8 4. Hinges: Spring-loaded, concealed-pin type.
 - 9 5. Latch: Cam latch with interior release.
 - 10 6. Lock: Cylinder.
- 11 E. Fire-Rated, Insulated, Flush Door Panels and Trimless Frames: Fabricated from steel sheet.
 - 12 1. Locations: Wall and ceiling surfaces.
 - 13 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 14 3. Temperature Rise Rating: 250 deg F at the end of 30 minutes.
 - 15 4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness
 - 16 of 0.036 inch.
 - 17 5. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead.
 - 18 6. Hinges: Concealed-pin type.
 - 19 7. Automatic Closer: Spring type.
 - 20 8. Latch: Self-latching device operated by knurled knob with interior release.
 - 21 9. Lock: Self-latching device with cylinder lock.

22 **2.3 HARDWARE**

- 23 A. Hinges: Heavy-duty, zinc-coated steel butt hinges with stainless-steel pins.
- 24 B. Latch: Stainless-steel slam latch.
- 25 C. Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all
- 26 brackets, hinges, pins, and fasteners.
- 27 D. Locks: Keyed deadlock bolt.

28 **2.4 FABRICATION**

- 29 A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- 30 B. All access panels to be insulated with weather stripping/light seal.
- 31 C. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.
- 32 Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- 33 D. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and
- 34 fasteners of type required to secure access panels to types of supports indicated.
- 35 E. Latching Mechanisms: Furnish number required to hold panels in flush, smooth plane when closed.
 - 36 1. For cylinder lock, furnish two keys per lock and key all locks alike.

37 **2.5 FINISHES**

- 38 A. Comply with NAAMM's, "Metal Finishes Manual for Architectural and Metal Products" for recommendations for
- 39 applying and designating finishes.
- 40 B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective
- 41 covering before shipping.
- 42 C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of
- 43 adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed
- 44 to minimize contrast.
- 45 D. Steel and Metallic-Coated-Steel Finishes:
 - 46 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free universal primer
 - 47 immediately after surface preparation and pretreatment.
 - 48 2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-
 - 49 on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil.

50 **2.6 LIGATURE RESISTANT ACCESS DOORS AND FRAMES**

- 51 A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be
- 52 incorporated in the Work include, but are not limited to, the following:
 - 53 1. Acudor, model BA-AL-9500.
 - 54 2. Whitehall Manufacturing, model WH2805 – Basis-of-design.

- 1 3. Or approved equal.
- 2 B. Material: 16 gage stainless steel, type 304.
- 3 C. Size: As required for application.
- 4 D. Location: Where indicated on the Drawings.

5 **PART 3 - EXECUTION**

6 **3.1 INSTALLATION**

- 7 A. Comply with manufacturer's written instructions for installing access doors and frames.
- 8 B. Set frames accurately in position and attach securely to supports with plane of face doors aligned with adjacent finish
- 9 surfaces.
- 10 C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

11 **3.2 ADJUSTING AND CLEANING**

- 12 A. Adjust doors and hardware after installation for proper operation.
- 13 B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

14 **END OF SECTION**

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**SECTION 08 33 23
OVERHEAD COILING DOORS**

PART 1 GENERAL

1.1 SUBMITTALS

- A. Procedures: Furnish submittals in accordance with the general requirements specified.
- B. Shop Drawing: Furnish shop drawings for architect's approval. Include elevations, sections, and details indicating dimensions, materials, finishes, conditions for anchorage and support of each counter shutter.
- C. Product Literature: Submit manufacturer's technical literature describing the product to be used under this section.
- D. Maintenance and Operating Manuals: Furnish complete manuals describing the materials, devices and procedures to be followed in operating and maintaining all counter shutters under this section. Include manufacturer's brochures and parts lists describing the actual materials used in the product.

1.2 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of federal, state and municipal authorities having jurisdiction.
- B. Manufacturer Requirements: Counter shutter manufacturer shall have been in the business of and have experience in manufacturing the type of product covered under this specification section as well as giving credible service for a minimum of five (5) years. Provide list of at least ten (10) completed projects which include the products covered under this section.

1.3 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver and store materials in manufacturer's original packaging, labeled to show name, brand and type. Store materials in a protected dry location off the ground in accordance with manufacturer's instructions.

1.4 WARRANTY

- A. Counter Shutter Warranty: Provide Two (2) Year Warranty signed by the manufacturer and installer agreeing to repair or replace work which has failed as a result of defects in materials or workmanship. Upon notification within the warranty period, such defects shall be repaired at no cost to the owner.

PART 2 PRODUCTS

2.1 COILING SECURITY COUNTER SHUTTERS

- A. Manufacturer: Subject to compliance with requirements, provide model CS3000-M-A as manufactured by McKEON, or comparable products by the following:
 - a. C.H.I Overhead Doors.
 - b. CornellCookson.
 - c. Or approved equal.

2.2 MATERIALS

- A. Curtain: Shall be assembled of 18 gauge extruded aluminum interlocking slats. Slats shall have endlocks locking each end of alternate slats to act as a wearing surface and maintain slat alignment.
 - 1. Slats: Shall be of a cross section not less than 1½" wide by ½" deep.
- B. Bottom Bar: Shall consist of a custom aluminum tubular extrusion formed to fit slats.
- C. Guides: Each guide assembly shall be fabricated of a custom aluminum extrusions formed in a box type configuration.
- D. Mounting Brackets: Fabricated of hot rolled 1/8" steel plate minimum, brackets shall be provided to house ends of the counterbalance barrel assembly.
- E. Hood: Shall be provided to entirely enclose curtain and counterbalance barrel assembly. Hood shall be fabricated 18 gauge aluminum and designed to match brackets. Top and bottom shall be bent and reinforced for stiffness.
- F. Counterbalance Assembly: Counter shutter shall be counterbalanced by means of adjustable steel helical torsion springs attached to shaft enclosed in pipe with required mounting blocks or rings for attachment of curtain. Grease sealed bearings or self-lubricating graphite bearings shall be attached to the spring barrel which shall be fabricated of hot formed structural quality carbon steel seamless pipe.
- G. Electric Motor Operator: Counter shutter shall be provided with a compact power unit designed and built by the counter shutter manufacturer. Operator shall be equipped with an adjustable screw-type limit switch to break the circuit at termination of travel. High efficiency gearing running in an oil bath, shall be furnished together with a magnetic operated

1 brake, completely housed to protect against damage, dust and moisture. An efficient overload protection device, which
2 will break the power circuit and protect against damage to the motor windings shall be integral with the unit. Operator
3 is to be housed in a NEMA type 1 enclosure.

- 4 1. Motor: Shall be intermediate duty, thermally protected, ball bearing type with a class A or better insulation.
5 Horsepower of motor is to be 1/3hp minimum or of manufacturer's recommended size, which ever is greater.
- 6 2. Starter: Shall be size "0" magnetic reversing starter, across the line type with mechanical and electrical interlocks,
7 with 10 amp continuous rating and 24 volt control circuit.
- 8 3. Reducer: Spiral gear type, 70% efficiency minimum.
- 9 4. Brake: Magnetically activated, integral within the operator's housing.
- 10 5. Control Station: Provide surface mount push button control station marked open, close and stop.

11 H. Obstruction Sensing Device: The counter shutter shall be designed with an obstruction sensing safety edge. In the event
12 that the safety edge meets an obstruction during the normal closing operation, the counter shutter shall stop, reverse
13 and return to the open position.

14 I. Finish: After completion of fabrication, clean all metal surfaces to remove dirt and chemically treat to provide for paint
15 adhesion. All steel components shall receive a coat of prime paint finish and all exposed aluminum shall be of a clear
16 anodized finish.

17 **PART 3 EXECUTION**

18 **3.1 EXAMINATION**

- 19 A. Examine surfaces and field conditions to which this work is to be performed and notify architect if conditions of surfaces
20 exist which are detrimental to proper installation and timely completion of work.
- 21 B. Verify all dimensions taken at job site affecting the work. Notify the architect in any instance where dimensions vary.
- 22 C. Coordinate and schedule work under this section with work of other sections so as not to delay job progress.

23 **3.2 INSTALLATION**

- 24 A. Perform installation using only factory approved and certified representatives of the counter shutter manufacturer.
- 25 B. Install counter shutter assemblies at locations shown in perfect alignment and elevation, plumb, level, straight and true.
- 26 C. Adjust counter shutter installation to provide uniform clearances and smooth non-binding operation.

27 **3.3 FIELD QUALITY CONTROL**

- 28 A. Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- 29 B. Perform the following tests and inspections:
 - 30 a. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) Per Section
31 014350, Part 3.1.B.3.i).
 - 32 i. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing
33 total), performing out of sequence work as required to facilitate testing schedule.
 - 34 ii. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total,
35 or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP,
36 and Architect.
 - 37 iii. Pass Criteria:
 - 38 1. Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure.
 - 39 b. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior
40 Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
 - 41 i. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing
42 total), performing out of sequence work as required to facilitate testing schedule.
 - 43 ii. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total,
44 or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP,
45 and Architect.
 - 46 iii. Pass Criteria:
 - 47 1. Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure.

48 **3.3 PROTECTION AND CLEANING**

- 49 A. Protect installed work using adequate and suitable means during and after installation until accepted by owner.
- 50 B. Remove, repair or replace materials which have been damaged in any way.
- 51 C. Clean surfaces of grime and dirt using acceptable and recommended means and methods.

52 **END OF SECTION**

08 36 00
SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glazed Aluminum Sectional Overhead Doors
- B. Roll-up screen door.

1.2 RELATED SECTIONS

- A. Section 01 91 19 – Building Enclosure Commissioning Requirements for administrative requirements related to field testing.
- B. Section 05500 - Metal Fabrications: Steel frame and supports.

1.3 REFERENCES

- A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Wind Loads: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
- B. Air Leakage Rate: Less than 0.40 cfm/sq ft when tested in accordance with ASTM E283/E283M at test pressure difference of 1.57 psf (75 Pa).
- C. Thermal Transmittance: U-factor of 0.31 Btu/hr sq ft degrees F maximum, in accordance with DASMA 102.
- D. Wiring Connections: See Electrical Drawings.
- E. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 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. Installation methods.
- B. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- D. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

- 1
2 1.7 DELIVERY, STORAGE, AND HANDLING
3 A. Store products in manufacturer's unopened labeled packaging until ready for installation.
4 B. Protect materials from exposure to moisture until ready for installation.
5 C. Store materials in a dry, ventilated weathertight location.
6
7 1.8 PROJECT CONDITIONS
8 A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of
9 field operations, to establish procedures to maintain optimum working conditions and to
10 coordinate this work with related and adjacent work.
11
12 **PART 2 PRODUCTS**
13
14 2.1 MANUFACTURERS
15 A. Basis-of-Design Product: Subject to compliance with requirements, provide 521 Series Aluminum
16 Doors by Overhead Door Corporation or comparable product by one of the following:
17 1. Upwardor, AL-976.
18 2. Clopay, 904U.
19 3. Or approved equal.
20
21 2.2 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS
22 A. Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.
23 1. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
24 a. Panel Thickness: 1-3/4 inches (44 mm).
25 b. Center Stile Width: 2-11/16 inches (68 mm)
26 c. End Stile Width: 3-5/16 inches (84 mm)
27 d. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
28 e. Top Rail Width:
29 1) 3-3/4 inches (95 mm).
30
31 f. Bottom Rail Width:
32 1) 4-1/2 inches (114 mm).
33
34 g. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
35 1) Bottom panel to be solid, anti-dent.
36
37 h. Stiles and Rails: 6063 - T6 aluminum.
38 i. Springs:
39 1) 10,000 cycles.
40
41 j. Glazing:
42 1) 1/2 inch (12.5 mm) Tempered Insulating glass.
43
44 2. Finish and Color:
45 a. Anodized Finish: Clear anodized.
46
47 3. Windload Design: Provide to meet the Design/Performance requirements specified.
48
49 4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
50
51 5. Lock: Interior galvanized single unit.
52
53 6. Weatherstripping:
54 a. Flexible bulb-type strip at bottom section.

- 1 b. Flexible Jamb seals.
- 2 c. Flexible Header seal.
- 3 7. Track: Provide track as recommended by manufacturer to suit loading required and
- 4 clearances available.
- 5 8. Manual Operation: Chain hoist as backup.
- 6 9. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended
- 7 by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1
- 8 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of
- 9 safety devices.
- 10 a. Entrapment Protection: Required for momentary contact, includes radio control
- 11 operation.
- 12 1) Photoelectric sensors monitored to meet UL 325/2010.

- 13 b. Operator Controls:
- 14 1) Key operated control stations with open, close, and stop buttons.

- 15 2) Interior location.

- 16 c. Special Operation:
- 17 1) Card reader control.

18 2.3 DOOR OPERATOR

- 19 A. Basis-of-Design Product: RLD Jackshaft Door Operator.

21 2.4 ROLL-UP SCREEN DOOR

- 22 A. Basis-of-Design Product: Subject to compliance with requirements, provide BugShield Roll-Up Screen
- 23 Door by RiteHite, or comparable product by an approved equal.
- 24 1. Overhead Door Company of Cortland.
- 25 2. W.E. Carlson Corp.
- 26 3. Or approved equal.
- 27 B. Curtain Material: Vinyl coated mesh.
- 28 C. Springs: Tempered steel with minimum cycle life of 10,000.
- 29 D. Track Material: Extruded PVC.
- 30 E. Seals: Manufacturer's standard.
- 31 F. Size: See Drawings.

33 **PART 3 EXECUTION**

35 3.1 EXAMINATION

- 36 A. Do not begin installation until openings have been properly prepared.
- 37 B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within
- 38 specified limits.
- 39 C. Verify electric power is available and of correct characteristics.
- 40 D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation
- 41 before proceeding.

43 3.2 PREPARATION

- 44 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.

3.3 INSTALLATION

- A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.
- B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- C. Anchor assembly to wall construction and building framing without distortion or stress.
- D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- E. Fit and align door assembly including hardware.
- F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
- G. Install screen door in conjunction with overhead door and in conformance with manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections:
 - 1. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) Per Section 014350, Part 3.1.B.3.i).
 - a. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total), performing out of sequence work as required to facilitate testing schedule.
 - b. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect.
 - c. Pass Criteria:
 - 1) Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure.
 - 2. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
 - a. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total), performing out of sequence work as required to facilitate testing schedule.
 - b. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect.
 - c. Pass Criteria:
 - 1) Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure.

3.5 CLEANING AND ADJUSTING

- A. Adjust door assembly to smooth operation and in full contact with weatherstripping.
- B. Clean doors, frames, and glass.
- C. Remove temporary labels and visible markings.

3.6 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

- 1 B. Protect installed products until completion of project.
- 2 C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.
- 3
- 4
- 5

END OF SECTION

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SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior and interior storefront framing, doors and windows.
- B. Related Sections
 - 1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.
 - 2. Division 07, "Joint Sealants."
 - 3. Division 08, "Door Hardware."
 - 4. Division 08, "Glazing."

1.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Failure of operating units.
 - g. Sealant failure.
- B. Wind Loads: As indicated on Drawings.
- C. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
- D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
 - 1. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 2. Test Durations: 10 seconds.
- E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.
- F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- G. AAMA 501.2, (Quality Assurance and Diagnostic Water Leakage Field Check).
- H. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors).
- I. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

- 1 1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system
- 2 to the exterior.
- 3 2. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication
- 4 and assembly of entrance door hardware, as well as procedures and diagrams.
- 5 C. Samples: For each type of exposed finish required.
- 6 D. Maintenance data to include in maintenance manuals.
- 7 E. Warranties: Sample of special warranties.
- 8 F. Sustainability Design Submittals:
- 9 1. Environmental Product Declarations: For each product.
- 10 2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- 11 3. Material Ingredient Reporting: For anodized products.
- 12

13 **1.4 QUALITY ASSURANCE**

- 14 A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of
- 15 units required for this Project.
- 16 B. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers
- 17 Compliance Board's ADA Standards for Accessible Design and ICC/ANSI A117.1.
- 18 C. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- 19 D. First-in-Place Mockup: Provide 25 sf of material mockup in place. Include as many corner, head, jamb, and sill
- 20 conditions as reasonably possible.
- 21 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if
- 22 undisturbed at time of Substantial Completion.
- 23

24 **1.5 PROJECT CONDITIONS**

- 25 A. Field Measurements: Verify actual locations and dimensions of structural supports for aluminum-framed systems by
- 26 field measurements before fabrication and indicate measurements on Shop Drawings.
- 27 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish
- 28 dimensions and proceed with fabricating aluminum-framed systems without field measurements.
- 29 Coordinate construction to ensure that actual dimensions correspond to established dimensions.
- 30

31 **1.6 WARRANTY**

- 32 A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of
- 33 aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within
- 34 specified warranty period. Failures include, but are not limited to structural failures, including, but not limited to
- 35 excessive deflection; noise or vibration caused by thermal movements; deterioration of metals, metal finishes and
- 36 other materials beyond normal weathering; water leakage through fixed glazing and framing areas; failure of
- 37 operating components.
- 38 1. Warranty Period: Five years from date of Substantial Completion.
- 39 B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace
- 40 components on which finishes do not comply with requirements or that fail in materials or workmanship within
- 41 specified warranty period. Warranty does not include normal weathering.
- 42 1. Warranty Period: 10 years from date of Substantial Completion.
- 43

44 **PART 2 - PRODUCTS**

45 **2.1 MANUFACTURERS**

- 46 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 47 1. Kawneer North America; an Alcoa company – Basis-of-Design.
- 48 2. Tubelite.
- 49 3. YKK.
- 50 4. Approved equal.
- 51
- 52

53 **2.2 MATERIALS**

- 54 A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
- 55 1. Sheet and Plate: ASTM B 209.
- 56 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
- 57 3. Extruded Structural Pipe and Tubes: ASTM B 429.
- 58 4. Structural Profiles: ASTM B 308/B 308M.

- 1 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- 2 B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-
- 3 PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation
- 4 methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC
- 5 standard.
- 6 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
- 7 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
- 8 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
- 9

10 **2.3 FRAMING SYSTEMS**

- 11 A. Basis-of-Design: 451UT System.
- 12 B. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and
- 13 reinforced as required to support imposed loads.
- 14 1. Exterior Framing: Thermally broken.
- 15 2. Interior Framing: Non-thermal.
- 16 3. Glazing System: Retained mechanically with gaskets on four sides.
- 17 4. Glazing Plane: As indicated.
- 18 C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims
- 19 for aligning system components.
- 20 D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and
- 21 accessories compatible with adjacent materials.
- 22 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural
- 23 movements, wind loads, or vibration.
- 24 2. Reinforce members as required to receive fastener threads.
- 25 3. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk
- 26 Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless
- 27 otherwise indicated.
- 28 E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with
- 29 adjacent materials.
- 30 F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
- 31 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less
- 32 when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 33

34 **2.4 GLAZING SYSTEMS**

- 35 A. Glazing: As specified in Division 08 Section "Glazing."
- 36 B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and
- 37 hardness required to maintain watertight seal.
- 38 C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.
- 39 D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not
- 40 develop adhesion.
- 41

42 **2.5 ENTRANCE DOOR SYSTEMS**

- 43 A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
- 44 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular
- 45 rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and
- 46 fillet welded or that incorporate concealed tie rods.
- 47 a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed
- 48 to the exterior from members exposed to the interior.
- 49 2. Door Design: As indicated on Drawings.
- 50 a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground
- 51 plane.
- 52 3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.
- 53 a. Provide non-removable glazing stops on outside of door.
- 54

55 **2.6 ENTRANCE DOOR HARDWARE**

- 56 A. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule
- 57 for each entrance door to comply with requirements in this Section.

- 1 1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named
- 2 manufacturers' products.
- 3 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface
- 4 with other building control systems indicated.
- 5 3. Opening-Force Requirements:
- 6 a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in
- 7 motion and not more than 15 lbf to open the door to its minimum required width.
- 8 b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- 9 B. Weather Stripping: Manufacturer's standard replaceable weather stripping.
- 10 C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- 11 D. Silencers: BHMA A 156.16, Grade 1.
- 12 E. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:3, with maximum height of
- 13 1/2 inch. Provide thermally broken thresholds for thermal entrances.
- 14 F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- 15 G. Operating Trim: BHMA A156.6.
- 16 H. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-
- 17 pivoted doors.

18 **2.7 SEALANTS**

- 19 A. Glazing Sealants: As recommended by manufacturer for joint type, and as follows:
- 20 1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component
- 21 neutral-curing formulation that is compatible with structural sealant and other system components with
- 22 which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed
- 23 system manufacturer for this use.
- 24 B. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible with
- 25 system components with which it comes in contact, specifically formulated and tested for use as structural sealant
- 26 and approved by a structural sealant manufacturer for use in aluminum-framed systems indicated.
- 27 C. Provide sealants for use inside of the weatherproofing system that have a VOC content of 100 g/L or less when
- 28 calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 29 1. Color: As selected by Architect from manufacturer's full range.
- 30

31 **2.8 ACCESSORY MATERIALS**

- 32 A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims
- 33 for aligning system components.
- 34 B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and
- 35 accessories compatible with adjacent materials.
- 36 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural
- 37 movements, wind loads, or vibration.
- 38 2. Reinforce aluminum members less than 0.125 inch thick to receive fastener threads or provide standard non-
- 39 corrosive pressed-in splined grommet nuts.
- 40 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- 41 C. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A
- 42 123/A 123M or ASTM A 153/A 153M.
- 43 D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with
- 44 adjacent materials, which do not bridge thermal breaks.
- 45 E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.
- 46 1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 260 g/L or less
- 47 when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 48 F. Air Baffles: Reticulated polymer filter foam with 30 pores per inch.
- 49 G. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing
- 50 no asbestos; formulated for 30-mil thickness per coat.
- 51

52 **2.9 FABRICATION**

- 53 A. Form or extrude aluminum shapes before finishing.
- 54 B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove
- 55 weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- 56 C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
- 57 1. Profiles that are sharp, straight, and free of defects or deformations.
- 58 2. Accurately fitted joints with ends coped or mitered.

- 1 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within
- 2 the system to exterior.
- 3 4. Physical and thermal isolation of glazing from framing members.
- 4 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing
- 5 edge clearances.
- 6 6. Provisions for field replacement of glazing from interior.
- 7 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- 8 D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- 9 E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance
- 10 door hardware.
- 11 F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- 12 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door
- 13 edge.
- 14 2. At exterior doors, provide weather sweeps applied to door bottoms.
- 15 G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut,
- 16 drill, and tap for factory-installed entrance door hardware before applying finishes.
- 17 H. Trim, Closures and Fillers: Fabricate to fit tightly to adjoining construction, with weather tight joints at exterior
- 18 installations, in maximum lengths to minimize joints. Product flat, flush surfaces without cracking or grain
- 19 separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch-wide hem on the
- 20 concealed side, or ease edges to a radius of approximately 1/32 inch and support with concealed stiffeners.
- 21 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush
- 22 alignment.
- 23 2. Build in straps, plates, and brackets as needed to support and anchor fabrications.
- 24 3. Partition Closures: Form closures at partition-mullion abutments from two aluminum sheets, separated by
- 25 channels of the same material to produce a panel of same thickness as partitions. Incorporate reveals, trim,
- 26 and concealed anchorages for attaching to adjacent surfaces.
- 27 I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
- 28

2.10 ENTRANCE DOOR HARDWARE SETS

- 29 A. See Division 08, Section "Door Hardware."
- 30
- 31

2.11 ALUMINUM FINISHES

- 32 A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations
- 33 for applying and designating finishes.
- 34 B. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
- 35
- 36

PART 3 - EXECUTION

3.1 EXAMINATION

- 39 A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance
- 40 with requirements for installation tolerances and other conditions affecting performance of work. Verify rough
- 41 opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders,
- 42 water and weather barriers, and other built-in components to ensure a coordinated, weather tight sliding door
- 43 installation.
- 44
- 45
- 46 1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
- 47 2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that
- 48 nail heads are driven flush with surfaces in opening and within 3 inches of opening.
- 49 3. Metal Surfaces: Dry; clean; free of grease, soil, dirt, rust, corrosion, and welding slag; without sharp edges or
- 50 offsets at joints.
- 51 4. Proceed with installation only after unsatisfactory conditions have been corrected.
- 52

3.2 INSTALLATION

- 53 A. General:
- 54 1. Comply with manufacturer's written instructions.
- 55 2. Do not install damaged components.
- 56 3. Fit joints to produce hairline joints free of burrs and distortion.
- 57 4. Rigidly secure nonmovement joints.
- 58

- 1 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
- 2 6. Seal joints watertight unless otherwise indicated.
- 3 B. Metal Protection:
- 4 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces
- 5 with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by
- 6 manufacturer for this purpose.
- 7 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces
- 8 with bituminous paint.
- 9 C. Install components to drain water passing joints, condensation occurring within framing members, and moisture
- 10 migrating within the system to exterior.
- 11 D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to
- 12 produce weather tight installation.
- 13 E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- 14 F. Install glazing as specified in Division 08 Section "Glazing."
- 15 G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
- 16 1. Exterior Doors: Install to produce weather tight enclosure and tight fit at weather stripping.
- 17 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to
- 18 entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent
- 19 possible.
- 20 H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:
- 21 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total
- 22 length.
- 23 2. Alignment:
- 24 a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
- 25 b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- 26 3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.
- 27 I. Adjust operating hardware for smooth operation according to hardware manufacturer's written instructions.
- 28 1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for
- 29 doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

30 **3.3 FIELD QUALITY CONTROL**

- 31 A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- 32 B. Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with
- 33 AAMA 501.2 and shall not evidence water penetration.
- 34 1. Test Schedule: At 10% and 50% installation completion, prior to installation of interior finishes, performing
- 35 out of sequence work as required to facilitate testing schedule.
- 36 2. Test Quantity: 200' linear per round (up to 400' total), as directed by Owner, BCxP, and Architect.
- 37 3. Pass Criteria: No visible water intrusion.
- 38 C. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors).
- 39 1. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total),
- 40 performing out of sequence work as required to facilitate testing schedule.
- 41 2. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all
- 42 openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect.
- 43 3. Pass Criteria:
- 44 a. Storefront: 0.15 cfm/sf at 6.27 PSF test pressure.
- 45 b. Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure.
- 46 c. Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure.
- 47 D. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows,
- 48 Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- 49 1. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing total),
- 50 performing out of sequence work as required to facilitate testing schedule.
- 51 2. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total, or all
- 52 openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP, and Architect.
- 53 3. Pass Criteria:
- 54 a. Storefront: 0.15 cfm/sf at 6.27 PSF test pressure.
- 55 b. Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure.

1 c. Overhead Doors: 0.60 cfm/sf at 1.57 PSF test pressure.

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3.4 ADJUSTING, CLEANING, AND PROTECTION

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A. Clean aluminum surfaces immediately after installing aluminum-framed storefront. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

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B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

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C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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D. Touch-up minor damage to factory applied finish; where damage has occurred in readily seen areas, replace damaged components. Finishes and surfaces that cannot be satisfactorily repaired or touched up to the Architect's and Owner's approval shall be replaced in-kind.

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E. Protect finished work from damage for the duration of the construction period or until acceptance by the Owner.

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**SECTION 08 42 29.23
SLIDING AUTOMATIC ENTRANCES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of automatic entrances:
 - 1. Exterior and interior, single slide and bi-parting, sliding automatic entrances, heavy duty.
- B. Related Sections:
 - 1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative requirements.
 - 2. Division 7 Sections for caulking to the extent not specified in this section.
 - 3. Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished and installed separately in Division 8 Section.
 - 4. Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
 - 5. Division 8 Section Glazing for materials and installation requirements of glazing for automatic entrances.
 - 6. Division 26 Sections for electrical connections provided separately, including conduit and wiring, for power to sliding automatic entrances.

1.2 REFERENCES

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. Underwriters Laboratories (UL):
 - 1. UL 325 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
- C. American National Standards Institute (ANSI) / Builders' Hardware Manufacturers Association (BHMA):
 - 1. ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
 - 2. ANSI/BHMA A156.5: Standard for Auxiliary Locks and Associated Products
- D. American Society for Testing and Materials (ASTM):
 - 1. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- E. American Association of Automatic Door Manufacturers (AAADM):
- F. National Fire Protection Association (NFPA):
 - 1. NFPA 101 – Life Safety Code.
 - 2. NFPA 70 – National Electric Code.
- G. International Code Council (ICC):
 - 1. IBC: International Building Code
- H. Building Officials and Code Administrators International (BOCA), 1999:
- I. International Organization for Standardization (ISO):
 - 1. ISO 9001 - Quality Management Systems
- J. National Association of Architectural Metal Manufacturers (NAAMM):

- 1 1. Metal Finishes Manual for Architectural and Metal Products.
- 2
- 3
- 4 K. American Architectural Manufacturers Association (AAMA):
- 5 1. [AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.]
- 6 2. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- 7 3. AAMA 701 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.
- 8

9 **1.3 DEFINITIONS**

- 10
- 11 A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.
- 12
- 13 B. Safety Device: Device that prevents a door from opening or closing, as appropriate.
- 14

15 **1.4 PERFORMANCE REQUIREMENTS**

- 16
- 17 A. General: Provide automatic entrance door assemblies capable of withstanding loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
- 18
- 19
- 20 B. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).
- 21
- 22 C. Opening-Force Requirements for Egress Doors: Force shall be adjustable; but, not more than 50 lbf (222 N) required to manually set swinging egress door panel(s) in motion.
- 23
- 24
- 25 D. Closing-Force Requirements: Not more than 30 lbf (133 N) required to prevent door from closing.
- 26

27 **1.5 SUBMITTALS**

- 28
- 29 A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- 30
- 31 B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.
- 32
- 33
- 34 C. Color Samples for selection of factory-applied color finishes.
- 35
- 36 D. Closeout Submittals:
- 37 1. Owner's Manual.
- 38 2. Warranties.
- 39

40 **1.6 QUALITY ASSURANCE**

- 41
- 42 A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained for installation and maintenance of units required for this Project.
- 43
- 44
- 45 B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001.
- 46
- 47 C. Manufacturer shall have in place a national service dispatch center providing 24 hours a day, 7 days a week, emergency call back service.
- 48
- 49
- 50 D. Certifications: Automatic sliding door systems shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
- 51 1. ANSI/BHMA A156.10.
- 52 2. NFPA 101.
- 53 3. UL 325 listed.
- 54 4. IBC 2015.
- 55 5. BOCA.
- 56
- 57
- 58 E. Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.

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- F. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of automatic entrance door assemblies and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- H. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.7 PROJECT CONDITIONS

- A. Field Measurements: General Contractor shall verify openings to receive automatic entrance door assemblies by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.
- C. Other trades: General Contractor shall advise of any inadequate conditions or equipment.

1.8 COORDINATION

- A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of automatic entrance door assemblies with connections to power supplies.

1.9 WARRANTY

- A. Automatic Entrances shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.
- B. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.
- C. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 AUTOMATIC ENTRANCES

- A. Manufacturer: Stanley Access Technologies; Dura-Guard™ 3000 Series sliding automatic entrances.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Headers, stiles, rails, and frames: 6063-T6.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Sheet and Plate: ASTM B 209.
- B. Sealants and Joint Fillers: Performed under Division 7 Section "Joint Sealants".

2.3 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

- 1 A. General: Provide manufacturer's standard automatic entrance door assemblies including doors, sidelights, framing,
2 headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for
3 a complete installation.
4
- 5 B. Sliding Automatic Entrances:
 - 6 1. Bi-Parting Entrances:
 - 7 a. Configuration: Two sliding leaves and two full sidelights.
 - 8 b. Traffic Pattern: Two-way.
 - 9 c. Emergency Breakaway Capability: Sliding leaves and sidelights.
 - 10 d. Mounting: Between jambs or surface applied. Coordinate with Architect.

11
12 **2.4 COMPONENTS**
13

- 14 A. Framing Members: Manufacturer's standard extruded aluminum reinforced as required to support imposed loads.
 - 15 1. Nominal Size: 1 3/4 inch by 6 inch (45 by 152 mm).
 - 16 2. Concealed Fastening: Framing shall incorporate a concealed fastening pocket, and continuous flush insert
17 cover, extending full length of each framing member.
18
- 19 B. Stile and Rail Doors and Sidelights: Manufacturer's standard 1 3/4 inch (45 mm) thick glazed doors with extruded-
20 aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom
21 rails. All corners, including intersections of stiles and rails or stiles and muntin bars, shall be welded secure.
 - 22 1. Glazing Stops and Gaskets: Snap-on, extruded-security aluminum stops and preformed gaskets.
 - 23 2. Stile Design: Medium stile; 3 1/2 inch (95 mm) nominal width.
 - 24 3. Bottom Rail Design: Minimum 10 inch (254 mm) nominal height.
 - 25 4. Muntin Bars: Horizontal tubular rail member for each door; 4 1/4 inch (108 mm) nominal height.
26
- 27 C. Glazing: Furnished under Division 8 Section Glazing.
 - 28 1. Glazing at exterior doors furnished under separate section shall be 1/4 inch (6 mm) tempered and 1 inch (25
29 mm) insulated, hermetically sealed.
 - 30 2. Glazing at interior doors furnished under separate section shall be 1/2 inch (13 mm) tempered.
31
- 32 D. Headers: Fabricated from extruded aluminum and extending full width of automatic entrance door units to conceal
33 door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and
34 adjustment of door operators and controls. Secure panels to prevent unauthorized access.
 - 35 1. Mounting: Concealed, with one side of header flush with framing.
 - 36 2. Capacity: Capable of supporting up to 220 lb (100 kg) per panel, up to four panels, over spans up to 14 feet
37 (4.3 m) without intermediate supports.
38
- 39 E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical
40 adjustment of at least 1/8 inch (3 mm); consisting of urethane with precision steel lubricated ball-bearing wheels,
41 operating on a continuous roller track. Support panels from carrier assembly by load wheels and anti-riser wheels
42 with factory adjusted cantilever and pivot assembly. Minimum two ball-bearing load wheels and two anti-rise
43 rollers for each active leaf. Minimum load wheel diameter shall be 2 1/2 inch (64 mm); minimum anti-rise roller
44 diameter shall be 2 inch (51 mm).
45
- 46 F. Kickplates: Provide manufacturer's standard kickplate.
47
- 48 G. Crash Guards: Crash guard with rubber shocks for glass.
49
- 50 H. Thresholds: Manufacturer's standard thresholds as indicated below:
 - 51 1. All thresholds to conform to details and requirements for accessibility code compliance.
52
- 53 I. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and
54 accessories compatible with adjacent materials.
55
- 56 J. Signage: Provide signage in accordance with ANSI/BHMA A156.10.
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2.5 DOOR OPERATORS

- A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, operation under normal traffic load for type of occupancy indicated.

- B. Electromechanical Operators: Two (2) self-contained overhead units, 1/4 horsepower minimum, permanent-magnet DC motors with gear reduction drives, microprocessor controller; and encoder.
 - 1. Operation: Power opening and power closing.
 - 2. Operation: Power opening and power closing.
 - 3. Features:
 - a. Adjustable opening and closing speeds.
 - b. Adjustable open check and close check speeds.
 - c. Adjustable hold-open time between 0 and 30 seconds.
 - d. Obstruction recycle.
 - e. On/Off switch to control electric power to operator.
 - f. Energy conservation switch that reduces door-opening width.
 - g. Closed loop speed control with active braking and acceleration.
 - h. Adjustable obstruction recycle time delay.
 - i. Self-adjusting stop position.
 - j. Self-adjusting closing compression force.
 - k. Onboard sensor power supply.
 - l. Onboard sensor monitoring.
 - m. Optional Switch to open/Switch to close operation.
 - n. Fire alarm interface, configurable to safely open or close the entrance on signal from fire alarm system.
 - 4. Mounting: Concealed.
 - 5. Drive System: Synchronous belt type.

- C. Electrical service to door operators shall be provided under Division 26 Electrical. Minimum service to be 120 VAC, 5 amps.

2.6 ELECTRICAL CONTROLS

- A. Electrical Control System: Electrical control system shall include a microprocessor controller and a high-resolution position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed.
 - 1. The high-resolution encoder shall have a resolution of not less than 1024 counts per revolution. Systems utilizing external magnets and magnetic switches are not acceptable.
 - 2. Electrical control system shall include a 24 VDC auxiliary output rated at 1 amp.
 - 3. A single controller shall be capable of controlling up to 2 operators per entrance system.

- B. Performance Data: The microprocessor shall collect, and store performance data as follows:
 - 1. Counter: A non-resettable counter to track operating cycles.
 - 2. Event Reporting: Unit shall include non-volatile event and error recording including number of occurrences of events and errors, and cycle count of most recent events and errors.
 - 3. LED Display: Display presenting the current operating state of the controller.

- C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:
 - 1. Automatic Reset Upon Power Up.
 - 2. Main Fuse Protection.
 - 3. Electronic Surge Protection.
 - 4. Internal Power Supply Protection.
 - 5. Resettable sensor supply fuse protection.
 - 6. Motor Protection, over-current protection.

- 1 D. Soft Start/Stop: A "soft-start" "soft-stop" motor driving circuit shall be provided for smooth normal opening and
2 recycling.
- 3
- 4 E. Obstruction Recycle: Provide system to recycle the sliding panels when an obstruction is encountered during the
5 closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by
6 reducing door closing speed prior to the previously encountered obstruction location, and will continue to close in
7 check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is
8 encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed
9 and operate signal is given, resetting the door to normal operation.
- 10
- 11 F. Programmable Controller: Microprocessor controller shall be field programmable.
 - 12 1. The following parameters may be adjusted:
 - 13 a. Operating speeds and forces as required to meet specified ANSI/BHMA standard.
 - 14 b. Adjustable and variable features specified.
 - 15 c. Reduced opening position.
 - 16 2. Manual programming shall be available through local interface which has a two-digit display with a
17 selection control including three push buttons.
- 18

19 2.7 ACTIVATION AND SAFETY DEVICES

- 20
- 21 A. Combined Activation and Safety Sensors: Combined activation and safety sensors shall, in a single housing, detect
22 motion and presence in accordance with ANSI/BHMA A156.10. Motion shall be detected using K-band microwave
23 technology, presence by active infrared reflection technology.
 - 24 1. Mounting Height: Up to 11.5 feet (3.5 m) above finish floor
 - 25 2. Temperature Range: Between -31°F and 131°F (-35°C to 55°C) in all environmental conditions
 - 26 3. Relays: Form C, 50V at 0.3A for both activation and safety. Hold time of less than 0.5 seconds.
 - 27 4. Detection Pattern: When detection is made in the activation zone, and the entrance opens, the safety zone
28 shall extend through the threshold on each side; creating an X-pattern. When activation and safety zones
29 are cleared and the entrance closes the sensor will ignore the X-pattern safety zones.
 - 30 5. Combined motion and presence sensors shall be equal to or better than X-Zone Sensor by Optex.
- 31
- 32 B. Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams.
33 Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting.
- 34
- 35 C. Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the
36 functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause
37 automatic operation to cease until the fault is corrected.
- 38

39 2.8 HARDWARE

- 40
- 41 A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers
42 for entrances and uses indicated.
- 43
- 44 B. Emergency Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to
45 full 90 degrees from any position in sliding mode. Maximum force to open panel shall be 50 lbf (222 N) according to
46 ANSI/BHMA A156.10. Interrupt powered operation of panel operator while in breakaway mode.
 - 47 1. Emergency breakaway feature shall include at least one adjustable detent device mounted, in the top of
48 each sliding breakaway panel, and in the top and bottom of each non-sliding breakaway panel, to control
49 panel breakaway force.
 - 50 2. Wind Resistant Damper: Provide factory installed concealed gas dampers in sliding or non-sliding breakaway
51 panel to protect door panels from wind damage. Dampers shall be designed to slow panel movement after
52 breakout.
- 53
- 54 C. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn; with
55 minimum 1 inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.
 - 56 1. Cylinders: As specified in Division 8 Section "Door Hardware."
 - 57 2. Hook Latch: Laminated-steel hook, mortise type, BHMA A156.5, Grade 1.

- 1 3. Two-Point Locking: On bi-parting entrances, provide locking system that incorporates a device in the stile of
- 2 active door leaves that automatically extends a flush bolt into overhead carrier assembly.
- 3 4. Armored Strike: Provide reinforced security strike plate on bi-parting entrances.
- 4
- 5 D. Control Switch: Provide manufacturer's standard rotary switch mounted on the interior jamb to allow for full
- 6 control of the automatic entrance door. Controls to include, but are not limited to:
- 7 1. One-way traffic
- 8 2. Reduced Opening
- 9 3. Open/Closed/Automatic
- 10
- 11 E. Power Switch: Sliding automatic entrances shall be equipped with a two position On/Off rocker switch to control
- 12 power to the door.
- 13
- 14 F. Sliding Weather Stripping: Manufacturer's standard replaceable components complying with AAMA 701; made of
- 15 wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- 16
- 17 G. Weather Sweeps: Manufacturer's standard adjustable nylon brush sweep mounted to underside of door bottom.
- 18

19 **2.9 FABRICATION**

- 20
- 21 A. General: Factory fabricates automatic entrance door assembly components to designs, sizes, and thickness
- 22 indicated and to comply with indicated standards.
- 23 1. Form aluminum shapes before finishing.
- 24 2. Use concealed fasteners to greatest extent possible.
- 25 a. Where fasteners are subject to loosening or turning out from thermal and structural movements,
- 26 wind loads, or vibration, use self-locking devices.
- 27 b. Reinforce members as required to receive fastener threads.
- 28
- 29 B. Framing: Provide automatic entrances as prefabricated assemblies.
- 30 1. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints.
- 31 Provide sub-frames and reinforcement as required for a complete system to support required loads.
- 32 2. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
- 33 3. Form profiles that are sharp, straight, and free of defects or deformations.
- 34 4. Prepare components to receive concealed fasteners and anchor and connection devices.
- 35 5. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints
- 36 free of burrs and distortion.
- 37
- 38 C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and
- 39 for installing hardware.
- 40
- 41 D. Welding: Comply with AWS A5.10/A5.10M - Specification for Bare Aluminum and Aluminum-Alloy Welding
- 42 Electrodes and Rods.
- 43
- 44 E. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- 45
- 46 F. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated.
- 47
- 48 G. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing
- 49 operation and for delivery to and installation at Project site.
- 50

51 **2.10 ALUMINUM FINISHES**

- 52
- 53 A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations
- 54 for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum
- 55 Association for designing finishes.
- 56

- 1 B. Class II, Clear Anodic Finish: AA-M12C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium
2 matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611-98, and
3 the following:
4 1. AAMA 607.1
5 2. Applicator must be fully compliant with all applicable environmental regulations and permits, including
6 wastewater and heavy metal discharge.
7
8

9 **PART 3 - EXECUTION**

10
11 **3.1 INSPECTION**

- 12
13 A. Examine conditions for compliance with requirements for installation tolerances, header support, and other
14 conditions affecting performance of automatic entrances. Proceed with installation only after unsatisfactory
15 conditions have been corrected.
16

17 **3.2 INSTALLATION**

- 18
19 A. General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly
20 secure non-movement joints.
21
22 B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp
23 or rack of framing members and doors. Anchor securely in place.
24 1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
25 2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with
26 anchorage for permanent support.
27
28 C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
29
30 D. Glazing: Performed under Division 8 Section "Glazing" in accordance with sliding automatic entrance
31 manufacturer's instructions.
32
33 E. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants".
34

35 **3.3 FIELD QUALITY CONTROL**

- 36
37 A. Testing Services: Factory Trained Installer shall test and inspect each automatic entrance door to determine
38 compliance of installed systems with applicable ANSI standards.
39 B. Perform the following tests and inspections:
40 1. ASTM E 783 (Field Measurement of Air Leakage Through Installed Exterior Windows and Doors) Per Section
41 014350, Part 3.1.B.3.i).
42 a. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing
43 total), performing out of sequence work as required to facilitate testing schedule.
44 b. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total,
45 or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP,
46 and Architect.
47 c. Pass Criteria:
48 1) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure.
49 2. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior
50 Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
51 a. Test Schedule: At the mockup and 10%, 30%, and 70% installation completion (4 rounds of testing
52 total), performing out of sequence work as required to facilitate testing schedule.
53 b. Test Quantity: 2 openings per round, not exceeding the total number of openings per type (8 total,
54 or all openings of a given type, if less than 8 of that type are present), as directed by Owner, BCxP,
55 and Architect.
56 c. Pass Criteria:
57 1) Exterior Doors, other than overhead: 0.15 cfm/sf at 6.27 PSF test pressure.
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3.4 ADJUSTING

- A. Adjust door operators, controls, and hardware for smooth and safe operation, for tight closure, and complying with requirements in ANSI/BHMA A156.10.

3.5 CLEANING AND PROTECTION

- A. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish. Comply with requirements in Division 8 Section "Glazing", for cleaning and maintaining glass.

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SECTION 08 45 23
FIBERGLASS-SANDWICH-PANEL WALL SYSTEM

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section includes the insulated, translucent sandwich panel system and accessories as shown and specified. Work
6 includes providing and installing:
- 7 1. Flat insulated, translucent sandwich panels
 - 8 2. Aluminum clamp-tite installation system
 - 9 3. Aluminum sill flashing
- 10 B. Related Sections:
- 11 1. Section 01 91 19 "Building Enclosure Commissioning Requirements" for performance testing administrative
12 requirements.
 - 13 2. 07 92 00 "Joint Sealants".

14 **1.2 SUBMITTALS**

- 15 A. Submit manufacturer's product data. Include construction details, material descriptions, profiles, and finishes of
16 components.
- 17 B. Submit shop drawings. Include plans, elevations, and details.
- 18 C. Submit manufacturer's color charts showing the full range of colors available for factory finished exposed aluminum.
- 19 1. When requested, submit samples for each exposed finish required, in same thickness and material indicated
20 for the work and in size indicated below.
 - 21 a. Sandwich panels: 7" x 12" units
 - 22 b. Factory finished aluminum: 3" long sections
- 23 D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
- 24 E. Sustainability Design Submittals:
- 25 1. Environmental Product Declarations: For each product.
- 26 F. Submit product reports from a qualified independent testing agency indicating each type and class of panel system
27 complies with the project performance requirements, based on comprehensive testing of current products.
28 Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this
29 project.
- 30 1. Reports required (if applicable) are:
 - 31 a. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
 - 32 b. Burn Extent (ASTM D 635)
 - 33 c. Color Difference (ASTM D 2244)
 - 34 d. Impact Strength (UL 972)
 - 35 e. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
 - 36 f. Bond Shear Strength (ASTM D 1002)
 - 37 g. Beam Bending Strength (ASTM E 72)
 - 38 h. Insulation U-Factor (NFRC 100)
 - 39 i. NFRC System U-Factor Certification (NFRC 700)
 - 40 j. NFRC Visible Light Transmittance (NFRC 202)
 - 41 k. Solar Heat Gain Coefficient (NFRC or Calculations)
 - 42 l. Condensation Resistance Factor (AAMA 1503) (Thermally Broken, insulated panels only)
 - 43 m. Air Leakage (ASTM E 283)
 - 44 n. Structural Performance (ASTM E 330)
 - 45 o. Water Penetration (ASTM E 331)
 - 46 p. Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure (ASTM
47 E2707)

48 **1.3 CLOSEOUT SUBMITTALS**

- 49 A. Provide field maintenance manual to include in project maintenance manuals.

- 1 **1.4 QUALITY ASSURANCE**
- 2 A. Manufacturer's Qualifications:
- 3 1. Material and products shall be manufactured by a company continuously and regularly employed in the
- 4 manufacture of specified materials for a period of at least ten consecutive years and which can show
- 5 evidence of those materials being satisfactorily used on at least six projects of similar size, scope, and
- 6 location. At least three of the projects shall have been in successful use for ten years or longer.
- 7 2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control
- 8 inspections and fire, structural, and water infiltration testing of sandwich panel systems by an accredited
- 9 agency.
- 10 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing
- 11 facilities, sandwich panel components, and production sandwich panels for conformance with AC177
- 12 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by
- 13 the ICC-ES.
- 14 B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing
- 15 Kalwall panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects
- 16 of similar size, scope, and type.

- 17 **1.5 PERFORMANCE REQUIREMENTS**
- 18 A. The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.
- 19 1. When requested, include span analysis data.
- 20 2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and
- 21 no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
- 22 3. Structural Loads. Provide system capable of handling the following loads:
- 23 a. Positive Wind Load (PSF): 24.7 ASD
- 24 b. Negative Wind Load (PSF): -30.8 ASD
- 25 B. Deflection Limits:
- 26 1. Walls: Limited to L/60 of clear span for each assembly component.
- 27 C. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base
- 28 calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- 29 1. Temperature Change (Range): 110 deg F (43 deg C), ambient; 150 deg F (66 deg C), material surfaces.
- 30 D. AAMA 501.2, (Quality Assurance and Diagnostic Water Leakage Field Check)

- 31 **1.6 DELIVERY, STORAGE AND HANDLING**
- 32 A. Deliver panel system, components, and materials in manufacturer's standard protective packaging.
- 33 B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with
- 34 manufacturer's storage and handling instructions.

- 35 **1.7 WARRANTY**
- 36 A. Provide manufacturer's and installer's written warranties agreeing to repair or replace panel system work, which fails
- 37 in material or workmanship, within five years from the date of delivery. Failure of material or workmanship shall
- 38 include deterioration of finish on metal in excess of normal weathering; and defects in accessories; insulated,
- 39 translucent sandwich panels; and other components of the work.
- 40 B. Extended Panel Warranty: 10 years from date of delivery.
- 41 C. Extended Manufacturer's factory applied Finish Warranty: 10 years from date of delivery.

42 **PART 2 - PRODUCTS**

- 43 **2.1 MANUFACTURER**
- 44 A. Basis-of-Design Product: Subject to compliance with requirements, provide Kalwall wall system or comparable
- 45 product by one of the following:
- 46 1. Major Industries, LLC.
- 47 2. Approved equal.

2.2 PANEL COMPONENTS

- A. Face Sheets:
 - 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
 - a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
 - b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
 - 2. Interior face sheets:
 - a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than **50** and smoke developed no greater than 450 when tested in accordance with UL 723.
 - b. Burn extent by ASTM D 635 shall be no greater than 1".
 - 3. Exterior face sheets:
 - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south as measured on a white sample, with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
 - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by handheld pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
 - c. Erosion Protection: Integral, embedded-glass erosion barrier.
 - 4. Appearance:
 - a. Exterior face sheet: Smooth, 0.070-inch thick and crystal in color.
 - b. Interior face sheet: Smooth, 0.052-inch thick and white in color.
 - c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.
- B. Grid Core:
 - 1. Thermally Broken Composite I-beam grid core shall be of alloy and temper recommended by manufacturer with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
 - 2. I-beam Thermal break: Minimum 2", thermoset fiberglass composite. Poured and de-bridged thermal break is not acceptable.
- C. Laminate Adhesive:
 - 1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
 - 2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
 - 3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a. 50% Relative Humidity at 68° F: 540 PSI
 - b. 182° F: 100 PSI
 - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

2.3 PANEL CONSTRUCTION

- A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
 - 1. Thickness: 2 3/4" inches.
 - 2. Grid Core Insulation: Fill panel cores with fiberglass batt.
 - 3. Panel U-factor by NFRC certified laboratory: thermally broken grid 0.23
 - 4. Complete insulated panel system shall have NFRC certified U-factor of 0.28
 - 5. Visible Light Transmittance (VLT):
 - a. Visible LT (NFRC 202) by NFRC certified laboratory: 26%.
 - 6. Solar heat gain coefficient 0.30.
 - 7. Grid pattern as viewed: Nominal size 24" x 12"; pattern shoji.
- B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
- C. Panels shall meet the conditions of acceptance according to ASTM E2707 Fire Penetration of Exterior Wall Assemblies Using a Direct Flame Impingement Exposure:

- 1 1. Absence of flame penetration through the wall assembly at any time.
- 2 2. Absence of evidence of glowing combustion on the interior surface of the assembly at the end of the 60-
- 3 min observation period.
- 4 3. Absence of evidence of flame, glow, and smoke if the test is terminated prior to the completion of the 60-
- 5 min observation period.
- 6 D. Thermally broken, insulated panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the
- 7 bond line.

8 **2.4 ALUMINUM CLAMPTITE INSTALLATION SYSTEM**

- 9 A. Aluminum clamp-tite installation system:
 - 10 1. Thermally Broken-Flat clamp-tite screw type closure system shall be of extruded aluminum alloy and temper
 - 11 as recommended by manufacturer.
- 12 B. Sealing tape: Manufacturer's standard, pre-applied to aluminum clamp-tite installation system at the factory under
- 13 controlled conditions.
- 14 C. Fasteners: 300 series stainless steel screws for aluminum clamp-tite installation system, excluding final fasteners to
- 15 the building.
- 16 D. Finish:
 - 17 1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to
 - 18 be Hartford Green #75.

19 **PART 3 - EXECUTION**

20 **3.1 EXAMINATION**

- 21 A. Installer shall examine substrates, supporting structure, and installation conditions.
- 22 B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

23 **3.2 PREPARATION**

- 24 A. Metal Protection:
 - 25 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces
 - 26 with primer or by applying sealant or tape recommended by sealant manufacturer for this purpose.
 - 27 2. Where aluminum will contact concrete, masonry, or pressure treated wood, protect against corrosion by
 - 28 painting contact surfaces with bituminous paint or method recommended by sealant manufacturer.

29 **3.3 INSTALLATION**

- 30 A. Install the panel system in accordance with the manufacturer's fabrication drawings and suggested installation
- 31 instructions.
 - 32 1. Anchor component parts securely in place by permanent mechanical attachment system.
 - 33 2. Accommodate thermal and mechanical movements.
 - 34 3. Seal aluminum clamp-tite installation system as shown on the manufacturer's fabrication drawings and
 - 35 suggested installation instructions.
- 36 B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturers fabrication
- 37 drawings and suggested installation instructions.
- 38
- 39

40 **3.4 FIELD QUALITY CONTROL**

- 41 A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- 42 B. AAMA 501.2, (Quality Assurance and Diagnostic Water Leakage Field Check)
 - 43 1. Test Schedule: At 10% and 50% installation completion, prior to installation of interior finishes, performing
 - 44 out of sequence work as required to facilitate testing schedule.
 - 45 2. Test Quantity: 200' linear per round (up to 400' total), as directed by Owner, BCxP, and Architect.
 - 46 3. Pass Criteria: No visible water intrusion.

- 1 **3.5 CLEANING**
- 2 A. Clean the panel system, interior and exterior, immediately after installation.
- 3 B. Refer to manufacturer's written recommendations.

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SECTION 08 71 00
DOOR HARDWARE

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section includes:

- 6 1. Mechanical and electrified door hardware
7 2. Electronic access control system components

8 B. Section excludes:

- 9 1. Windows
10 2. Cabinets (casework), including locks in cabinets
11 3. Signage
12 4. Toilet accessories
13 5. Overhead doors

14 C. Related Sections:

- 15 1. Division 01 Section "Alternates" for alternates affecting this section.
16 2. Division 06 Section "Rough Carpentry"
17 3. Division 06 Section "Finish Carpentry"
18 4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in
19 this section.
20 5. Division 08 Sections:
21 a. "Metal Doors and Frames"
22 b. "Flush Wood Doors"
23 c. "Stile and Rail Wood Doors"
24 d. "Interior Aluminum Doors and Frames"
25 e. "Aluminum-Framed Entrances and Storefronts"
26 f. "Stainless Steel Doors and Frames"
27 g. "Special Function Doors"
28 h. "Entrances"
29 6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
30 7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic
31 access control system and fire alarm system.

32 **1.2 REFERENCES**

33 A. UL LLC

- 34 1. UL 10B - Fire Test of Door Assemblies
35 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
36 3. UL 1784 - Air Leakage Tests of Door Assemblies
37 4. UL 305 - Panic Hardware

38 B. DHI - Door and Hardware Institute

- 39 1. Sequence and Format for the Hardware Schedule

- 1 2. Recommended Locations for Builders Hardware
- 2 3. Keying Systems and Nomenclature
- 3 4. Installation Guide for Doors and Hardware

- 4 C. NFPA – National Fire Protection Association

- 5 1. NFPA 70 – National Electric Code
- 6 2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
- 7 3. NFPA 101 – Life Safety Code
- 8 4. NFPA 105 – Smoke and Draft Control Door Assemblies
- 9 5. NFPA 252 – Fire Tests of Door Assemblies

- 10 D. ANSI - American National Standards Institute

- 11 1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
- 12 2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
- 13 3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
- 14 4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
- 15 5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

16 **1.3 SUBMITTALS**

- 17 A. General:

- 18 1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
- 19 2. Prior to forwarding submittal:
- 20 a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
- 21 b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract
- 22 Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

- 23 B. Action Submittals:

- 24 1. Product Data: Submit technical product data for each item of door hardware, installation instructions,
- 25 maintenance of operating parts and finish, and other information necessary to show compliance with
- 26 requirements.
- 27 2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door
- 28 hardware, indicating:
- 29 a. Wiring Diagrams: For power, signal, and control wiring and including:
- 30 1) Details of interface of electrified door hardware and building safety and security systems.
- 31 2) Schematic diagram of systems that interface with electrified door hardware.
- 32 3) Point-to-point wiring.
- 33 4) Risers.

- 34 3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware
- 35 unit in finish indicated and tagged with full description for coordination with schedule.
- 36 a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of
- 37 operations, be incorporated into Work, within limitations of key coordination requirements.

- 38 4. Door Hardware Schedule:
- 39 a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate
- 40 submission of door hardware schedule with scheduling requirements of other work to facilitate
- 41 fabrication of other work critical in Project construction schedule.
- 42 b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware
- 43 Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as
- 44 illustrated by Sequence of Format for the Hardware Schedule published by DHI.
- 45 c. Indicate complete designations of each item required for each opening, include:

- 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.
 - 8) Door and frame sizes and materials.
 - 9) Degree of door swing and handing.
 - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
 2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Final approved hardware schedule edited to reflect conditions as installed.
 - d. Final keying schedule
 - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
 - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
- E. Inspection and Testing:
1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. Fire door assemblies, in compliance with NFPA 80.
 - b. Required egress door assemblies, in compliance with NFPA 101.

1.4 QUALITY ASSURANCE

- A. Qualifications and Responsibilities:

- 1 1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience
2 supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to
3 that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer
4 of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a
5 certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner,
6 Architect, and Contractor, at reasonable times during the Work for consultation.
- 7 2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience
8 installing door hardware similar in quantity, type, and quality as indicated for this Project.
- 9 3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door
10 hardware installations that are comparable in material, design, and extent to that indicated for this Project
11 and meets these requirements:
12 a. For door hardware: DHI certified AHC or DHC.
13 b. Can provide installation and technical data to Architect and other related subcontractors.
14 c. Can inspect and verify components are in working order upon completion of installation.
15 d. Capable of producing wiring diagram and coordinating installation of electrified hardware with
16 Architect and electrical engineers.
- 17 4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- 18 B. Certifications:
19 1. Fire-Rated Door Openings:
20 a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of
21 authorities having jurisdiction.
22 b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing
23 Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for
24 use on types and sizes of doors indicated, based on testing at positive pressure and according to
25 NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- 26 2. Smoke and Draft Control Door Assemblies:
27 a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and
28 installed in compliance with NFPA 105
29 b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure
30 differential of 0.3-inch wg (75 Pa) of water.
- 31 3. Electrified Door Hardware
32 a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities
33 having jurisdiction.
- 34 4. Accessibility Requirements:
35 a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein
36 for door hardware on doors in an accessible route. This project must comply with all Federal Americans
37 with Disability Act regulations and all Local Accessibility Regulations.
- 38 C. Pre-Installation Meetings
39 1. Keying Conference
40 a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware
41 keying system including:
42 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans
43 for future expansion.
44 2) Preliminary key system schematic diagram.
45 3) Requirements for key control system.
46 4) Requirements for access control.
47 5) Address for delivery of keys.
- 48 2. Pre-installation Conference

- 1 a. Review and finalize construction schedule and verify availability of materials, Installer's personnel,
- 2 equipment, and facilities needed to make progress and avoid delays.
- 3 b. Inspect and discuss preparatory work performed by other trades.
- 4 c. Inspect and discuss electrical roughing-in for electrified door hardware.
- 5 d. Review sequence of operation for each type of electrified door hardware.
- 6 e. Review required testing, inspecting, and certifying procedures.
- 7 f. Review questions or concerns related to proper installation and adjustment of door hardware.

- 8 3. Electrified Hardware Coordination Conference:
- 9 a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with
- 10 security, electrical, doors and frames, and other related suppliers.

11 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 12 A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly
- 13 replace products damaged during shipping.

- 14 B. Tag each item or package separately with identification coordinated with final door hardware schedule, and
- 15 include installation instructions, templates, and necessary fasteners with each item or package. Deliver each
- 16 article of hardware in manufacturer's original packaging.

- 17 C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

- 18 D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware
- 19 items so that completion of Work will not be delayed by hardware losses both before and after installation.

- 20 E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products
- 21 damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical
- 22 agent.

- 23 F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

24 **1.6 COORDINATION**

- 25 A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring
- 26 inserts into concrete.

- 27 B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared.
- 28 Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing
- 29 door hardware to comply with indicated requirements.

- 30 C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

- 31 D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections
- 32 to power supplies and building safety and security systems.

33 **1.7 WARRANTY**

- 34 A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware
- 35 that fail in materials or workmanship within published warranty period.

- 36 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

- 1 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's
- 2 published listings.
- 3 a. Mechanical Warranty
- 4 1) Locks
- 5 a) 3 years
- 6 2) Exit Devices
- 7 a) 3 years
- 8 3) Closers
- 9 a) 30 years
- 10 4) Automatic Operators
- 11 a) 2 years
- 12 b. Electrical Warranty
- 13 1) Locks
- 14 a) 1 year
- 15 2) Exit Devices
- 16 a) 1 year

17 **1.8 MAINTENANCE**

- 18 A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing
- 19 of cylinders.
- 20 B. Turn over unused materials to Owner for maintenance purposes.

21 **PART 2 - PRODUCTS**

22 **2.1 MANUFACTURERS**

- 23 A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or
- 24 "Acceptable Manufacturers" in the individual article for the product category are only to be considered by
- 25 official substitution request in accordance with section 01 25 00.
- 26 B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those
- 27 products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- 28 C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish
- 29 suitable types having same operation and quality as type specified, subject to Architect's approval.

30 **2.2 MATERIALS**

- 31 A. Fabrication
- 32 1. Provide door hardware manufactured to comply with published templates generally prepared for machine,
- 33 wood, and sheet metal screws. provide screws according to manufacturer's recognized installation
- 34 standards for application intended.
- 35 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of
- 36 this other work including prepared for paint surfaces to receive painted finish.
- 37 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate
- 38 with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper
- 39 reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- 40 B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

- 1 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- 2 C. Cable and Connectors:
- 3 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with
- 4 number and gage of wires enough to accommodate electric function of specified hardware.
- 5 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power
- 6 transfer devices.
- 7 3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness
- 8 for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for
- 9 connection to power supplies.

10 **2.3 HINGES**

- 11 A. Manufacturers and Products:
- 12 1. Scheduled Manufacturer and Product:
- 13 a. Ives 5BB series
- 14 2. Acceptable Manufacturers and Products:
- 15 a. Alternates Considered by Official Substitution Request Only
- 16 B. Requirements:
- 17 1. Provide hinges conforming to ANSI/BHMA A156.1.
- 18 2. Provide five knuckle, ball bearing hinges.
- 19 3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
- 20 a. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
- 21 4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
- 22 a. Interior: Heavy weight, steel, 5 inches (127 mm) high
- 23 5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
- 24 6. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge
- 25 for each 30 inches (762 mm) of additional door height.
- 26 7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
- 27 a. Steel Hinges: Steel pins
- 28 b. Non-Ferrous Hinges: Stainless steel pins
- 29 c. Out-Swinging Exterior Doors: Non-removable pins
- 30 d. Out-Swinging Interior Lockable Doors: Non-removable pins
- 31 e. Interior Non-lockable Doors: Non-rising pins

32 **2.4 CONTINUOUS HINGES**

- 33 A. Manufacturers:
- 34 1. Scheduled Manufacturer and Product:
- 35 a. Ives 700 series
- 36 2. Acceptable Manufacturers:
- 37 a. Alternates Considered by Official Substitution Request Only
- 38 B. Requirements:
- 39 1. Provide pin and barrel continuous hinges conforming to ANSI/BHMA A156.26., Grade 1.

- 1 2. Provide pin and barrel continuous hinges fabricated from 14-gauge, type 304 stainless steel.
- 2 3. Provide twin self-lubricated nylon bearings at each hinge knuckle, with 0.25-inch (6 mm) diameter stainless
- 3 steel pin.
- 4 4. Provide hinges capable of supporting door weights up to 600 pounds, and successfully tested for 1,500,000
- 5 cycles.
- 6 5. On fire-rated doors, provide pin and barrel continuous hinges classified for use on rated doors by testing
- 7 agency acceptable to authority having jurisdiction.
- 8 6. Provide pin and barrel continuous hinges with electrified options as scheduled in the hardware sets. Provide
- 9 with number and gage of wires enough to accommodate electric function of specified hardware.
- 10 7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or
- 11 door details require shorter length and with symmetrical hole pattern.

12 2.5 CONTINUOUS HINGES

13 A. Manufacturers:

- 14 1. Scheduled Manufacturer:
- 15 a. Ives
- 16 2. Acceptable Manufacturers:
- 17 a. Alternates Considered by Official Substitution Request Only

18 B. Requirements:

- 19 1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
- 20 2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6
- 21 aluminum.
- 22 3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
- 23 4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000
- 24 cycles.
- 25 5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing
- 26 agency acceptable to authority having jurisdiction.
- 27 6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide
- 28 with number and gage of wires enough to accommodate electric function of specified hardware.
- 29 7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or
- 30 door details require shorter length and with symmetrical hole pattern.

31 2.6 ELECTRIC POWER TRANSFER

32 A. Manufacturers:

- 33 1. Scheduled Manufacturer and Product:
- 34 a. Von Duprin EPT-10 CON
- 35 2. Acceptable Manufacturers and Products:
- 36 a. Alternates Considered by Official Substitution Request Only

37 B. Requirements:

- 38 1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and
- 39 gage of wires enough to accommodate electric function of specified hardware.
- 40 2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with
- 41 operation of door or other hardware items.

1 **2.7 FLUSH BOLTS**

2 A. Manufacturers:

- 3 1. Scheduled Manufacturer:
4 a. Ives

- 5 2. Acceptable Manufacturers:
6 a. Alternates Considered by Official Substitution Request Only

7 B. Requirements:

- 8 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face
9 plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or
10 brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height
11 increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-
12 proof strikes at each bottom flush bolt.

13 **2.8 COORDINATORS**

14 A. Manufacturers:

- 15 1. Scheduled Manufacturer:
16 a. Ives

- 17 2. Acceptable Manufacturers:
18 a. Alternates Considered by Official Substitution Request Only

19 B. Requirements:

- 20 1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires
21 synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of
22 stop at frame head.
23 2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for
24 parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-
25 prepared coordinators for vertical rod devices as specified.

26 **2.9 MORTISE LOCKS**

27 A. Manufacturers and Products:

- 28 1. Scheduled Manufacturer and Product:
29 a. Schlage L9000 series

- 30 2. Acceptable Manufacturers and Products:
31 a. Alternates Considered by Official Substitution Request Only

32 B. Requirements:

- 33 1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire
34 doors.
35 2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-
36 degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy
37 visibility.

- 1 3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate
2 plating for corrosion resistance.
- 3 4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders:
4 Refer to "KEYING" article, herein.
- 5 5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel
6 mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless
7 steel.
- 8 6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified
9 options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into
10 the locks and latches.
- 11 7. Provide motor based electrified locksets that comply with the following requirements:
12 a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without
13 changing lock chassis.
14 b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked
15 (fail secure) is field selectable without opening the lock case.
16 c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
17 d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in
18 electrically locked applications, and to provide reliable operation in wood doors that provide minimal
19 ventilation and air flow.
20 e. Connections – provide quick-connect Molex system standard.
- 21 8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and
22 external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
23 a. Lever Design: 07A, SL1 and HSLR.

24 **2.10 CYLINDRICAL LOCKS – GRADE 1**

25 A. Manufacturers and Products:

- 26 1. Scheduled Manufacturer and Product:
27 a. Schlage ND series
- 28 2. Acceptable Manufacturers and Products:
29 a. Alternates Considered by Official Substitution Request Only

30 B. Requirements:

- 31 1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour
32 fire doors.
- 33 2. Cylinders: Refer to "KEYING" article, herein.
- 34 3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch
35 throw. Provide proper latch throw for UL listing at pairs.
- 36 4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
- 37 5. Provide independently operating levers with two external return spring cassettes mounted under roses to
38 prevent lever sag.
- 39 6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
- 40 7. Provide electrified options as scheduled in the hardware sets.
- 41 8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
42 a. Lever Design: ATH.

43 **2.11 EXIT DEVICES**

44 A. Manufacturers and Products:

- 45 1. Scheduled Manufacturer and Product:

- 1 a. Von Duprin 98 series and Detex 10XW Series
- 2 2. Acceptable Manufacturers and Products:
- 3 a. Alternates Considered by Official Substitution Request Only
- 4 B. Requirements:
- 5 1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
- 6 2. Cylinders: Refer to "KEYING" article, herein.
- 7 3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated
- 8 to standard architectural finishes to match balance of door hardware.
- 9 4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
- 10 5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other
- 11 electrified requirements.
- 12 6. Provide exit devices with weather resistant components that can withstand harsh conditions of various
- 13 climates and corrosive cleaners used in outdoor pool environments.
- 14 7. Provide flush end caps for exit devices.
- 15 8. Provide exit devices with manufacturer's approved strikes.
- 16 9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device
- 17 manufacturer, allowable by governing building codes, and approved by Architect.
- 18 10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass
- 19 trim or molding projects off face of door, provide glass bead kits.
- 20 11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
- 21 12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas,
- 22 and where noted in hardware sets.
- 23 13. Provide electrified options as scheduled.
- 24 14. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors
- 25 eliminating requirement of tabs, and double tab mount for wood doors.
- 26 15. Provide exit devices with optional trim designs to match other lever and pull designs used on the project as
- 27 well as Accurate anti-ligature trim.

28 **2.12 ELECTRIC STRIKES**

- 29 A. Manufacturers and Products:
- 30 1. Scheduled Manufacturer and Product:
- 31 a. Von Duprin 6000 Series and Securitron 55 Series
- 32 2. Acceptable Manufacturers and Products:
- 33 a. Alternates Considered by Official Substitution Request Only
- 34 B. Requirements:
- 35 1. Provide electric strikes designed for use with type of locks shown at each opening.
- 36 2. Provide electric strikes UL Listed as burglary resistant that are tested to a minimum endurance test of
- 37 1,000,000 cycles.
- 38 3. Where required, provide electric strikes UL Listed for fire doors and frames.
- 39 4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

40 **2.13 MAGNETIC LOCKS**

- 41 A. Manufacturers:
- 42 1. Scheduled Manufacturer:
- 43 a. Schlage

- 1 2. Acceptable Manufacturers:
- 2 a. Alternates Considered by Official Substitution Request Only

- 3 B. Requirements:

- 4 1. Provide magnetic locks certified to meet ANSI/BHMA A156.23 classification criteria, UL10C, and UL1034 for
- 5 burglary-resistant electronic locking mechanisms.
- 6 2. Provide magnetic locks equipped with SPDT Magnetic Bond Sensing device, where specified, to monitor
- 7 whether enough magnetic holding force exists to ensure adequate locking and SPDT Door Status Monitor
- 8 device, where specified, to monitor whether door is open or closed. Provide bond sensors fully concealed
- 9 within electromagnet to resist tampering or damage.
- 10 3. Provide fasteners, mounting brackets, and spacer bars required for mounting and details.
- 11 4. Provide power supply recommended and approved by manufacturer of magnetic locks.
- 12 5. Where magnetic locks are scheduled, provide complete assemblies of controls, switches, power supplies,
- 13 relays, and parts/material recommended and approved by manufacturer of magnetic locks for each
- 14 individual leaf. Switches control both doors simultaneously at pairs. Locate controls as directed by Architect.

15 **2.14 POWER SUPPLIES**

- 16 A. Manufacturers and Products:

- 17 1. Scheduled Manufacturer and Product:
- 18 a. Schlage/Von Duprin PS900 Series

- 19 2. Acceptable Manufacturers and Products:
- 20 a. Alternates Considered by Official Substitution Request Only

- 21 B. Requirements:

- 22 1. Provide power supplies approved by manufacturer of supplied electrified hardware.
- 23 2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking
- 24 components as recommended by manufacturer of electrified locking components with consideration for
- 25 each electrified component using power supply, location of power supply, and approved wiring diagrams.
- 26 Locate power supplies as directed by Architect.
- 27 3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
- 28 4. Provide power supplies with the following features:
- 29 a. 12/24 VDC Output, field selectable.
- 30 b. Class 2 Rated power limited output.
- 31 c. Universal 120-240 VAC input.
- 32 d. Low voltage DC, regulated and filtered.
- 33 e. Polarized connector for distribution boards.
- 34 f. Fused primary input.
- 35 g. AC input and DC output monitoring circuit w/LED indicators.
- 36 h. Cover mounted AC Input indication.
- 37 i. Tested and certified to meet UL294.
- 38 j. NEMA 1 enclosure.
- 39 k. Hinged cover w/lock down screws.
- 40 l. High voltage protective cover.

41 **2.15 CYLINDERS**

- 42 A. Manufacturers and Products:

- 43 1. Scheduled Manufacturer and Product:
- 44 a. Schlage Everest 29 R

- 1 2. Acceptable Manufacturers and Products:
- 2 a. Alternates Considered by Official Substitution Request Only

- 3 B. Requirements:

- 4 1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match
- 5 lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
- 6 2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
- 7 a. Patented Restricted Small Format: cylinder with small format interchangeable cores (SFIC) with
- 8 restricted, patented keyway.

- 9 3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
- 10 4. Nickel silver bottom pins.

11 **2.16 KEYING**

- 12 A. Scheduled System:

- 13 1. New factory registered system:
- 14 a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28,
- 15 incorporating decisions made at keying conference.

- 16 B. Requirements:

- 17 1. Construction Keying:
- 18 2. Permanent Keying:
- 19 a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
- 20 1) Master Keying system as directed by the Owner.
- 21 b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to
- 22 comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no
- 23 additional cost to Owner.
- 24 c. Provide keys with the following features:
- 25 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
- 26 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
- 27 d. Identification:
- 28 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not
- 29 provide blind code marks with actual key cuts.
- 30 2) Identification stamping provisions must be approved by the Architect and Owner.
- 31 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by
- 32 the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with
- 33 the "PATENTED" or patent number to enforce the patent protection.
- 34 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at
- 35 no additional cost to Owner.
- 36 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by
- 37 Owner.
- 38 e. Quantity: Furnish in the following quantities.
- 39 1) Permanent Control Keys: 3.
- 40 2) Master Keys: 6.
- 41 3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
- 42 4) Key Blanks: Quantity as determined in the keying meeting.

43 **2.17 KEY CONTROL SYSTEM**

- 44 A. Manufacturers:

- 1 1. Scheduled Manufacturer:
- 2 a. Telkee

- 3 2. Acceptable Manufacturers:
- 4 a. HPC
- 5 b. Lund

- 6 B. Requirements:

- 7 1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way
- 8 visible card index, temporary markers, permanent markers, and standard metal cabinet, all as
- 9 recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
- 10 a. Provide complete cross index system set up by hardware supplier, and place keys on markers and
- 11 hooks in cabinet as determined by final key schedule.
- 12 b. Provide hinged-panel type cabinet for wall mounting.

13 **2.18 DOOR CLOSERS**

- 14 A. Manufacturers and Products:

- 15 1. Scheduled Manufacturer and Product:
- 16 a. LCN 4040XP series

- 17 2. Acceptable Manufacturers and Products:
- 18 a. Alternates Considered by Official Substitution Request Only

- 19 B. Requirements:

- 20 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified
- 21 independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
- 22 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder,
- 23 and full complement bearings at shaft.
- 24 3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated
- 25 pinion journal. QR code with a direct link to maintenance instructions.
- 26 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for
- 27 temperatures ranging from 120 degrees F to -30 degrees F.
- 28 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force
- 29 as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that
- 30 secures cover to spring tube.
- 31 6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed,
- 32 general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each
- 33 adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
- 34 7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for
- 35 parallel arm closers.
- 36 8. Pressure Relief Valve (PRV) Technology: Not permitted.
- 37 9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been
- 38 certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or
- 39 has special rust inhibitor (SRI).
- 40 10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details,
- 41 overhead stops, and other door hardware items interfering with closer mounting.

42 **2.19 DOOR CLOSERS – HIGH SECURITY**

- 43 A. Manufacturers and Products:

- 1 1. Scheduled Manufacturer and Product:
- 2 a. LCN 4210/4510 Smoothee Series
- 3 2. Acceptable Manufacturers and Products:
- 4 a. Alternates Considered by Official Substitution Request Only
- 5 B. Requirements:
- 6 1. Provide high security door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA
- 7 certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture
- 8 code.
- 9 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder,
- 10 and full complement bearings at shaft.
- 11 3. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for
- 12 temperatures ranging from 120 degrees F to -30 degrees F.
- 13 4. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force
- 14 as required by accessibility codes and standards.
- 15 5. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed,
- 16 general speed, and backcheck.
- 17 6. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for
- 18 parallel arm closers.
- 19 7. Pressure Relief Valve (PRV) Technology: Not permitted.
- 20 8. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been
- 21 certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or
- 22 has special rust inhibitor (SRI).
- 23 9. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details,
- 24 overhead stops, and other door hardware items interfering with closer mounting.

25 **2.20 PNEUMATIC AUTOMATIC OPERATORS**

- 26 A. Manufacturers:
- 27 1. Scheduled Manufacturer:
- 28 a. LCN
- 29 2. Acceptable Manufacturers:
- 30 a. Alternates Considered by Official Substitution Request Only
- 31 B. Requirements:
- 32 1. Provide low energy automatic operator units that are pneumatically powered complying with ANSI/BHMA
- 33 A156.19.
- 34 2. Provide units with conventional door closer opening and closing forces unless power operator motor is
- 35 activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing
- 36 speed adjustment valves to control door:
- 37 a. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment
- 38 for temperatures ranging from 120 degrees F to -30 degrees F.
- 39 b. Power: Continuously adjustable over full range of closer sizes, with reduced opening force for
- 40 physically handicapped.
- 41 c. Regulation: By tamper-proof, non-critical valves. Provide closers with separate adjustment for latch
- 42 speed, general speed, and backcheck.
- 43 3. Provide separate conduits to carry high and low voltage wiring in compliance with National Electric Code,
- 44 section 725-31.
- 45 4. When obstruction or resistance to opening swing is encountered, operator continues attempting to open
- 46 door.

- 1 5. Provide operator designed to prevent damage to mechanism if system is actuated while door is latched or if
- 2 door is forced closed during opening cycle.
- 3 6. Locate power unit and exhaust away from door to minimize noise and vibration in pedestrian areas.
- 4 7. Provide drop plates, brackets, and adapters for arms as required for details.
- 5 8. Provide actuator switches and receivers for operation as specified. Provide weather-resistant actuators at
- 6 exterior applications.
- 7 9. Provide complete assemblies of compressor, control boxes, tubing, switches, power supplies, relays, and
- 8 parts/material recommended and approved by manufacturer of automatic operator for each individual leaf.
- 9 Actuators control both doors simultaneously at pairs. Sequence exterior and vestibule doors with automatic
- 10 operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators
- 11 and other controls as directed by Architect. Consult manufacturer for applications where tubing is run in
- 12 rated plenums.
- 13 10. Provide control box or module with inputs and outputs, which allow sequencing operation, fire alarm
- 14 system connections, actuators, swing side sensors, stop sensors, and SPDT relay for interfacing with latching
- 15 or locking devices. Where required provide control box for "blow open" operation controlled by smoke
- 16 evacuation system.

17 **2.21 PROTECTION PLATES**

- 18 A. Manufacturers:
- 19 1. Scheduled Manufacturer:
- 20 a. Ives
- 21 2. Acceptable Manufacturers:
- 22 a. Alternates Considered by Official Substitution Request Only
- 23 B. Requirements:
- 24 1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled.
- 25 Furnish with sheet metal or wood screws, finished to match plates.
- 26 2. Size plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors
- 27 with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
- 28 3. At fire rated doors, provide protection plates over 16 inches high with UL label.

29 **2.22 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS**

- 30 A. Manufacturers:
- 31 1. Scheduled Manufacturers:
- 32 a. Glynn-Johnson
- 33 2. Acceptable Manufacturers:
- 34 a. Alternates Considered by Official Substitution Request Only
- 35 B. Requirements:
- 36 1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents
- 37 tripping hazard.

38 **2.23 DOOR STOPS AND HOLDERS**

- 39 A. Manufacturers:

- 1 1. Scheduled Manufacturer:
- 2 a. Ives

- 3 2. Acceptable Manufacturers:
- 4 a. Alternates Considered by Official Substitution Request Only

- 5 B. Provide door stops at each door leaf:

- 6 1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
- 7 2. Where a wall stop cannot be used, provide universal floor stops.
- 8 3. Where wall or floor stop cannot be used, provide overhead stop.
- 9 4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

10 **2.24 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING**

- 11 A. Manufacturers:

- 12 1. Scheduled Manufacturer:
- 13 a. Zero International

- 14 2. Acceptable Manufacturers:
- 15 a. Alternates Considered by Official Substitution Request Only

- 16 B. Requirements:

- 17 1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details.
- 18 Match finish of other items.
- 19 2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required,
- 20 provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in
- 21 compliance with NFPA 105.
- 22 3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal
- 23 strip is easily replaceable and readily available.
- 24 4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified
- 25 in the hardware sets or detailed in the drawings.

26 **2.25 MAGNETIC HOLDERS**

- 27 A. Manufacturers:

- 28 1. Scheduled Manufacturer:
- 29 a. LCN

- 30 2. Acceptable Manufacturers:
- 31 a. Alternates Considered by Official Substitution Request Only

- 32 B. Requirements:

- 33 1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of
- 34 holding force. Coordinate projection of holder and armature with other hardware and wall conditions to
- 35 ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the
- 36 fire control panel for fail-safe operation.

37 **2.26 DOOR POSITION SWITCHES**

- 1 A. Manufacturers:
- 2 1. Scheduled Manufacturer:
- 3 a. Schlage
- 4 2. Acceptable Manufacturers:
- 5 a. Alternates Considered by Official Substitution Request Only
- 6 B. Requirements:
- 7 1. Provide recessed or surface mounted type door position switches as specified.
- 8 2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with
- 9 magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking
- 10 device.

11 **2.27 FINISHES**

- 12 A. FINISH: BHMA 626/652 (US26D); EXCEPT:
- 13 1. Pin and Barrel Hinges at Exterior Doors: BHMA 630 (US32D)
- 14 2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
- 15 3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
- 16 4. Protection Plates: BHMA 630 (US32D)
- 17 5. Overhead Stops and Holders: BHMA 630 (US32D)
- 18 6. Door Closers: Powder Coat to Match
- 19 7. Wall Stops: BHMA 630 (US32D)
- 20 8. Weatherstripping: Clear Anodized Aluminum
- 21 9. Thresholds: Mill Finish Aluminum

22 **PART 3 - EXECUTION**

23 **3.1 EXAMINATION**

- 24 A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with
- 25 requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor
- 26 construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly
- 27 reinforced for hardware installation.
- 28 B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before
- 29 electrified door hardware installation.
- 30 C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have
- 31 been corrected.

32 **3.2 INSTALLATION**

- 33 A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to
- 34 comply with governing regulations.
- 35 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
- 36 2. Custom Steel Doors and Frames: HMMA 831.
- 37 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A

- 1 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- 2 B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as
3 specified in section 1.03.E unless otherwise required to comply with governing regulations.
- 4 C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only
5 fasteners provided by manufacturer.
- 6 D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed
7 hardware during painting.
- 8 E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for
9 proper installation and operation.
- 10 F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors
11 according to industry standards.
- 12 G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- 13 H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity
14 recommended by manufacturer for application indicated.
- 15 I. Lock Cylinders:
- 16 1. Furnish permanent cores to GC for installation.
- 17 J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
- 18 1. Conduit, junction boxes and wire pulls.
19 2. Connections to and from power supplies to electrified hardware.
20 3. Connections to fire/smoke alarm system and smoke evacuation system.
21 4. Connection of wire to door position switches and wire runs to central room or area, as directed by
22 Architect.
23 5. Connections to panel interface modules, controllers, and gateways.
24 6. Testing and labeling wires with Architect's opening number.
- 25 K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as
26 determined by final keying schedule.
- 27 L. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior
28 doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in
29 corridors, lobbies and other public spaces unless approved by Architect.
- 30 M. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior
31 doors, and stair side of stairway doors.
- 32 N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment
33 room, or alternate location as directed by Architect.
- 34 O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section
35 "Joint Sealants."
- 36 P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do
37 not mount floor stops where they may impede traffic or present tripping hazard.
- 38 Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

- 1 R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- 2 S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3 **3.3 ADJUSTING**

- 4 A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper
5 operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door
6 control devices to compensate for final operation of heating and ventilating equipment and to comply with
7 referenced accessibility requirements.
 - 8 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 9 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of
10 authorities having jurisdiction.
- 11 B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and
12 readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of
13 doors and door hardware.

14 **3.4 CLEANING AND PROTECTION**

- 15 A. Clean adjacent surfaces soiled by door hardware installation.
- 16 B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- 17 C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration
18 at time of Substantial Completion.

19 **3.5 DOOR HARDWARE SCHEDULE**

- 20 A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to
21 establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to
22 thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to
23 verify the suitability of the hardware specified.
- 24 B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with
25 corrections made prior to the bidding process. Omitted items not included in a hardware set should be
26 scheduled with the appropriate additional hardware required for proper application.
- 27 C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special
28 features, options, cylinders/keying, and other requirements.
- 29 D. Hardware Sets:
30

31 101632 OPT0350375 Version 5

32 Hardware Group No. 01

33 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	LIGATURE RESISTANT EXIT DEVICE OUTSIDE TRIM	PASSAGE FUNCTION CRESCENT HANDLE CH- 996L-BE	US26D	ACC
1	EA	PANIC HARDWARE	LD-98-EO-SEC X RAL 7047 49/72020	626/RAL	VON
1	EA	H-SEC SURFACE CLOSER	4510T AVB MC TORX (PULL SIDE MOUNT) - USE BACKCHECK FEATURE AS DOOR STOP	689	LCN
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	NOTE	WEATHERSTRIPPING, MEETING STILE SEALS, THRESHOLD, SWEEP BY DOOR/FRAME SUPPLIER	UNF	BYO

1 WIDE STILE DOOR REQUIRED.

2

3 OPENING TO BE MONITORED ONLY.

4

5 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

6 1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT.

7

8 Hardware Group No. 02

9 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU 07A RX LX DPS CON 12/24 VDC	630	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA X 4040XP-18PA X 4040XP-61	689	LCN
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	NOTE	WEATHERSTRIPPING, MEETING STILE SEALS, THRESHOLD, SWEEP BY DOOR/FRAME SUPPLIER	UNF	BYO

10 WIDE STILE DOOR REQUIRED.

11

12 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

13

14 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
15 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
16 KEYED INGRESS IS ALSO AVAILABLE.

17

18 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

19 1) CREDENTIAL READER DEVICE.

20 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
21 ELECTRIFIED LOCK.

22

1 Hardware Group No. 03

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CUSTOM UNDERCUT	REQUIRED TO SEAL THE BOTTOM OF THE DOOR	PRI	STE
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	LIGATURE RESISTANT EXIT DEVICE OUTSIDE TRIM	STOREROOM FUNCTION CRESCENT HANDLE CP-C-VD99	US26D	ACC
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-98-EO-CON-SEC 24 VDC	626	VON
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	RAIN DRIP	142AA X SEC SCREWS	AA	ZER
2	EA	JAMB SEALS	328AA X SEC SCREWS	AA	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO HEAD MTD HDW)	429A X SECURITY SCREWS	AA	ZER
1	EA	DOOR SWEEP	39A X SECURITY SCREWS	AA	ZER
1	EA	THRESHOLD	566A-V3-223 X SECURITY SCREWS	AL	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO RETRACT THE LATCHES AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT
6 OR THE LX LATCHBOLT MONITOR SWITCH INSIDE THE PANIC DEVICE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
7 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE QEL ELECTRIC LATCH RETRACTION FEATURE INSIDE THE PANIC
12 DEVICE AS WELL AS WIRING TO THE QEL FEATURE ITSELF.

13 3) REQUIRED POWER AND WIRING TO THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE FIRE EXIT HARDWARE.

14

1 Hardware Group No. 04

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CUSTOM UNDERCUT	REQUIRED TO SEAL THE BOTTOM OF THE DOOR	PRI	STE
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-98-L-F-M996-07-FSE-CON	626	VON
1	EA	SFIC RIM HOUSING	80-129	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	SURFACE CLOSER	4040XP SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
 5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
 6 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
 7 KEYED INGRESS IS ALSO AVAILABLE.

8
 9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 10 1) CREDENTIAL READER DEVICE.
- 11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
- 12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 05

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CUSTOM UNDERCUT	REQUIRED TO SEAL THE BOTTOM OF THE DOOR	PRI	STE
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	CONST LATCHING BOLT	FB51P TORX	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	EU MORTISE LOCK	L9092BDEU 07A RX LX CON 12/24 VDC	630	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	COORDINATOR	COR X FL (MTG BRACKETS AS REQD) X TORX	628	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH WMS	689	LCN
2	EA	ARMOR PLATE	8400 40" X 1" LDW B-CS - NOTCH AS REQD	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	OVERLAPPING ASTRAGAL	322A-S	A	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	ASTRAGAL	43SP	SP	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACTS AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
7 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 06

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CUSTOM UNDERCUT	REQUIRED TO SEAL THE BOTTOM OF THE DOOR	PRI	STE
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	CONST LATCHING BOLT	FB51P TORX	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	EU MORTISE LOCK	L9092BDEU 07A RX LX CON 12/24 VDC	630	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	COORDINATOR	COR X FL (MTG BRACKETS AS REQD) X TORX	628	IVE
2	EA	SURFACE CLOSER	4040XP SHCUSH WMS	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	OVERLAPPING ASTRAGAL	322A-S	A	ZER
1	SET	JAMB SEALS	328AA-S	628	ZER
1	EA	HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW)	429A	AA	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	ASTRAGAL	43SP	SP	ZER
1	EA	THRESHOLD	566A-V3-223	A	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACTS AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
7 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 07

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	LIGATURE RESISTANT EXIT DEVICE OUTSIDE TRIM	STOREROOM FUNCTION CRESCENT HANDLE CP-C-VD99	US26D	ACC
2	EA	ELEC FIRE EXIT HARDWARE	LXRX-LC-QEL-9849-EO-F-CON-SEC 24 VDC	626	VON
2	EA		SECURITY SCREW-EPT10	630	VON
2	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
2	EA	H-SEC SURFACE CLOSER	4210T MC TORX (PUSH SIDE MOUNT)	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX	630	IVE
2	EA	MAGNET	SEM7800 X AS REQ'D (VERIFY WALL DISTANCES)	689	LCN
2	SET	MEETING STILE	328AA-S (SEC SCREWS)	AA	ZER
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
2	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS-FA 120/240 VAC	LGR	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO RETRACT THE LATCHES AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT
6 OR THE LX LATCHBOLT MONITOR SWITCH INSIDE THE FIRE EXIT HARDWARE ALLOWING INGRESS. IMMEDIATE EGRESS IS
7 ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8
9 WALL MAGNETS AND THE POWER SUPPLY ARE TO BE TIED TO THE FIRE ALARM SYSTEM.

10
11 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 12 1) CREDENTIAL READER DEVICE.
- 13 2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE QEL ELECTRIC LATCH RETRACTION FEATURE INSIDE THE FIRE
- 14 EXIT HARDWARE AS WELL AS WIRING TO THE QEL FEATURE ITSELF.
- 15 3) REQUIRED POWER AND WIRING TO THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE FIRE EXIT HARDWARE.

16

1 Hardware Group No. 08

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	LIGATURE RESISTANT EXIT DEVICE OUTSIDE TRIM	PASSAGE FUNCTION CRESCENT HANDLE CH- 996L-BE	US26D	ACC
2	EA	ELEC FIRE EXIT HARDWARE	RX-LC-9849-EO-F-CON-SEC	626	VON
2	EA		SECURITY SCREW-EPT10	630	VON
2	EA	SHEAR LOCK	GF3000TRD DSM/MBS 12/24 VDC	335	SCE
2	EA	H-SEC SURFACE CLOSER	4510T MC TORX (PULL SIDE MOUNT) - TEMPLATE 1 DOOR FOR 180 DEGREE SWING	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX	630	IVE
2	EA	MAGNET	SEM7800 X AS REQ'D (VERIFY WALL DISTANCES)	689	LCN
2	SET	MEETING STILE	328AA-S (SEC SCREWS)	AA	ZER
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
2	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SAFE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE ON THE PULL SIDE IS TO CUT POWER TO THE MAGNETIC LOCK AND SHUNT ANY ALARMS
6 ASSOCIATED WITH THE MONITOR SWITCHES INSIDE THE MAGNETIC LOCK ALLOWING INGRESS.

7
8 IMMEDIATE EGRESS IS ALWAYS AVAILABLE BY PRESSING THE PANIC BAR WHICH SENDS A SIGNAL FROM THE RX SWITCH INSIDE
9 THE PANIC BAR TO RELEASE THE MAGNETIC LOCK AND SHUNT ANY ALARMS ASSOCIATED WITH THE MONITOR SWITCHES
10 INSIDE THE MAGNETIC LOCK.

11
12 THE MAGNETIC LOCK IS TO BE TIED TO THE FIRE ALARM SYSTEM. REMOTE UNLOCKING WITHOUT UNLATCHING FROM THE
13 FIRE ALARM PANEL IS AVAILABLE.

14
15 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
16 1) CREDENTIAL READER DEVICE.
17 2) REQUIRED POWER AND WIRING TO THE MAGNETIC LOCK, THE RX SWITCH INSIDE THE FIRE EXIT HARDWARE, AND THE
18 MONITOR SWITCHES INSIDE THE MAGNETIC LOCK.

19

1 Hardware Group No. 09

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	LIGATURE RESISTANT EXIT DEVICE OUTSIDE TRIM	PASSAGE FUNCTION CRESCENT HANDLE CH- 996L-BE	US26D	ACC
1	EA	ELEC FIRE EXIT HARDWARE	RX2-98-EO-F-ALK-CON-SEC 9-VOLT BATTERY WITH HARDWIRED OPTION	626	VON
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC MORTISE CYL.	80-102 X CORRECT CAM	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	SHEAR LOCK	GF3000TRD DSM/MBS 12/24 VDC	335	SCE
1	EA	H-SEC SURFACE CLOSER	4510T MC TORX (PULL SIDE MOUNT)	689	LCN
1	EA	REMOTE RELEASE DEVICE	AIPHONE OR SIMILAR SYSTEM BY OTHERS		B/O
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SAFE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE ON THE PULL SIDE OR THE REMOTE RELEASE DEVICE IS TO CUT POWER TO THE MAGNETIC LOCK
6 AND SHUNT ANY ALARMS ASSOCIATED WITH THE MONITOR SWITCHES INSIDE THE MAGNETIC LOCK ALLOWING INGRESS.

7
8 CREDENTIAL READER DEVICE ON THE PUSH SIDE IS TO CUT POWER TO THE MAGNETIC LOCK AND SHUNT ANY ALARMS
9 ASSOCIATED WITH THE MONITOR SWITCHES INSIDE THE MAGNETIC LOCK, AND THE ALARM INSIDE THE FIRE EXIT HARDWARE
10 ALLOWING UNALARMED EGRESS.

11
12 IMMEDIATE ALARMED EGRESS IS ALWAYS AVAILABLE BY PRESSING THE PANIC BAR WHICH SENDS A SIGNAL FROM ONE OF THE
13 RX SWITCHES INSIDE THE PANIC BAR TO RELEASE THE MAGNETIC LOCK WHILE THE OTHER RX SWITCH TRIGGERS THE ALARM .
14 RE-SETTING THE ALARM ONCE TRIGGERED CAN BE DONE WITH A KEY OR THE ACCESS CONTROL SYSTEM.

15
16 THE MAGNETIC LOCK IS TO BE TIED TO THE FIRE ALARM SYSTEM. REMOTE UNLOCKING WITHOUT UNLATCHING FROM THE
17 FIRE ALARM PANEL IS AVAILABLE.

18
19 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 20 1) CREDENTIAL READER DEVICES.
21 2) REQUIRED POWER AND WIRING TO THE MAGNETIC LOCK, THE ALARM KIT AND RX SWITCHES INSIDE THE FIRE EXIT
22 HARDWARE, AND THE MONITOR SWITCHES INSIDE THE MAGNETIC LOCK.

23
24 Hardware Group No. 10

25 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-07	626	VON
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

26

1 Hardware Group No. 11

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	LIGATURE RESISTANT EXIT DEVICE OUTSIDE TRIM	STOREROOM FUNCTION CRESCENT HANDLE CP-C-VD99	US26D	ACC
1	EA	ELEC PANIC HARDWARE	LXRX-LC-QEL-98-EO-CON-SEC 24 VDC	626	VON
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC MORTISE CYL.	80-102 X CORRECT CAM	626	SCH
1	EA	SFIC RIM HOUSING	80-129	626	SCH
2	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO RETRACT THE LATCHES AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT
6 OR THE LX LATCHBOLT MONITOR SWITCH INSIDE THE PANIC DEVICE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
7 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE QEL ELECTRIC LATCH RETRACTION FEATURE INSIDE THE PANIC
12 DEVICE AS WELL AS WIRING TO THE QEL FEATURE ITSELF.

13 3) REQUIRED POWER AND WIRING TO THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE FIRE EXIT HARDWARE.

14

1 Hardware Group No. 12

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	CONST LATCHING BOLT	FB51P TORX	630	IVE
1	EA	DUST PROOF STRIKE	DP2 TORX	626	IVE
1	EA	EU MORTISE LOCK	L9092BDEU 07A RX LX CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
2	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
2	EA	OH STOP & HOLDER	450F J SOC	630	GLY
1	EA	H-SEC SURFACE CLOSER	4210T HCUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
2	SET	MEETING STILE	328AA-S (SEC SCREWS)	AA	ZER
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PUSH SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACTS AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
7 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 13

2 Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	CONST LATCHING BOLT	FB51P TORX	630	IVE
1	EA	DUST PROOF STRIKE	DP2 TORX	626	IVE
1	EA	EU MORTISE LOCK	L9092BDEU 07A RX LX CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
2	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	COORDINATOR	COR X FL (MTG BRACKETS AS REQD) X TORX	628	IVE
2	EA	H-SEC SURFACE CLOSER	4210T HCUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS TKTX	630	IVE
2	SET	MEETING STILE	328AA-S (SEC SCREWS)	AA	ZER
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
2	EA	DOOR CONTACT	679-05HM	BLK	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PUSH SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACTS AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
7 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACTS, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 14

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX LX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4510T MC TORX (PULL SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
7 KEYED INGRESS IS ALSO AVAILABLE.

8
9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 10 1) CREDENTIAL READER DEVICE.
11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

14 Hardware Group No. 15

15 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD ATH	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

16 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

17
18 CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
19 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

20
21 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 22 1) CREDENTIAL READER DEVICE.
23 2) REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE.

24

1 Hardware Group No. 16

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	ND80BDEU ATH RX CON 12V/24V DC	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	SURFACE CLOSER	4040XP REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACT ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

7
8 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 9 1) CREDENTIAL READER DEVICE.
10 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE RX SWITCH INSIDE THE
11 ELECTRIFIED LOCK.
12

13 Hardware Group No. 17

14 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4510T MC TORX (PULL SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

15 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

16
17 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
18 CONTACT ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

19
20 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 21 1) CREDENTIAL READER DEVICE.
22 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE RX SWITCH INSIDE THE
23 ELECTRIFIED LOCK.
24

1 Hardware Group No. 18

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX LX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
7 KEYED INGRESS IS ALSO AVAILABLE.

8
9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 10 1) CREDENTIAL READER DEVICE.
11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 19

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX LX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
7 KEYED INGRESS IS ALSO AVAILABLE.

8
9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 10 1) CREDENTIAL READER DEVICE.
11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

14 Hardware Group No. 20

15 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX LX DPS CON 12/24 VDC	630	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH TORX	689	LCN
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

16 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

17
18 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
19 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
20 KEYED INGRESS IS ALSO AVAILABLE.

21
22 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 23 1) CREDENTIAL READER DEVICE.
24 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
25 ELECTRIFIED LOCK.

26

1 Hardware Group No. 21

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80BD ATH	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
6 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

7
8 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 9 1) CREDENTIAL READER DEVICE.
10 2) REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE.

12 Hardware Group No. 22

13 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

14 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

15
16 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
17 CONTACT ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

18
19 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 20 1) CREDENTIAL READER DEVICE.
21 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE RX SWITCH INSIDE THE
22 ELECTRIFIED LOCK.

23

1 Hardware Group No. 23

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	ND80BD ATH	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4
5 CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
6 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

7
8 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 9 1) CREDENTIAL READER DEVICE.
10 2) REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE.

11
12 Hardware Group No. 24

13 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9095BDEU SL1 XL12-482 LX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
2	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

14 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

15
16 CREDENTIAL READER DEVICE ON EITHER SIDE OF THE DOOR IS TO UNLOCK THE LEVER AND SHUNT ANY ALARMS ASSOCIATED
17 WITH THE DOOR CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS/EGRESS. KEYED INGRESS
18 AND EGRESS IS ALSO AVAILABLE.

19
20 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

- 21 1) CREDENTIAL READER DEVICES.
22 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX SWITCH INSIDE THE
23 ELECTRIFIED LOCK.

24

1 Hardware Group No. 25

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9095BDEU SL1 XL12-482 LX DPS CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
2	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE ON EITHER SIDE OF THE DOOR IS TO UNLOCK THE LEVER AND SHUNT ANY ALARMS ASSOCIATED
6 WITH THE DOOR CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS/EGRESS. KEYED INGRESS
7 AND EGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICES.

11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX SWITCH INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 26

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM	630	IVE
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU MORTISE LOCK	L9492BDEU SL1 XL12-482 RX LX DM CON 12/24 VDC	630	SCH
1	EA		SECURITY SCREW-EPT10	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	ELECTRIC STRIKE W-DEADBOLT MONITOR SWITCH	55 - D - DBM X TORX SCREWS	630	SDC
1	EA	CONC. AUTO OPERATOR	2614 SPEC	689	LCN
1	EA	CONTROL BOX	7902ES		LCN
2	EA	ACTUATOR, TOUCHLESS	8310-810S	630	LCN
1	EA	TUBING (LENGTH AS REQUIRED)	925	CLR	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	POWER SUPPLY	PS904 900-4R-FA 120/240 VAC	LGR	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO ENALBE THE PUSH SIDE AUTO-OPERATOR ACTUATOR BUTTON, UNLOCK THE PULL SIDE
6 LEVER, RELEASE THE ELECTRIC STRIKE AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR CONTACT AND THE LX SWITCH
7 INSIDE THE ELECTRIFIED LOCK ALLOWING MANUAL OR AUTOMATIC INGRESS. IMMEDIATE MANUAL OR AUTOMATIC EGRESS IS
8 ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

9

10 POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR.

11

12 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

13 1) CREDENTIAL READER DEVICE.

14 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
15 ELECTRIFIED LOCK.

16 3) WIRING TO THE PS904 POWER SUPPLY AND THE 7902ES AUTO-OPERATOR CONTROL BOX INSIDE ROOM 142. THE 7902ES
17 CAN CONTROL 2 INDEPENDENT DOORS.

18

19 COMPRESSOR INSIDE ROOM 142 IS TO BE PROVIDED BY OTHERS.

20

1 Hardware Group No. 27

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	PRIV W/DB COIN TURN	L9444 HSLR 09-664 10-072	630	SCH
1	EA	ELECTRIC STRIKE W-DEADBOLT MONITOR SWITCH	55 - D - DBM X TORX SCREWS	630	SDC
1	EA	CONC. AUTO OPERATOR	2614 SPEC	689	LCN
1	EA	CONTROL BOX	7902ES		LCN
2	EA	ACTUATOR, TOUCHLESS	8310-810S	630	LCN
1	EA	TUBING (LENGTH AS REQUIRED)	925	CLR	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH
1	EA	POWER SUPPLY	PS904 900-4R-FA 120/240 VAC	LGR	SCE

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 DOOR IS NORMALLY UNLOCKED AND THE AUTO-OPERATOR IS ON ALLOWING MANUAL OR AUTOMATIC INGRESS. IMMEDIATE
6 MANUAL OR AUTOMATIC EGRESS IS ALWAYS AVAILABLE. THE ELECTRIC STRIKE'S DEADBOLT MONITOR SWITCH IS TO BE WIRED
7 TO CUT POWER TO THE AUTO-OPERATOR ONCE THE DEADBOLT ON THE LOCK IS THROWN.

8

9 POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR.

10

11 ITEMS TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR:

12 1) WIRING TO THE PS904 POWER SUPPLY, WHICH POWERS THE ELECTRIC STRIKE AND THE AUTO-OPERATOR, AND THE 7902ES
13 AUTO-OPERATOR CONTROL BOX INSIDE ROOM 142. THE 7902ES CAN CONTROL 2 INDEPENDENT DOORS.

14

15 COMPRESSOR INSIDE ROOM 142 IS TO BE PROVIDED BY OTHERS.

16

1 Hardware Group No. 28

2 Provide each SGL door(s) with the following:

QTY	EA	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT EPT SECHM - OUTER DOOR	630	IVE
1	EA	CONT. HINGE	700-HT SECHM - INNER DOOR	630	IVE
1	EA	POWER TRANSFER	EPT10 CON - OUTER DOOR	689	VON
1	EA	EU MORTISE LOCK	L9092BDEU SL1 XL12-482 RX LX DPS CON 12/24 VDC - OUTER DOOR	630	SCH
1	EA		SECURITY SCREW-EPT10 - OUTER DOOR	630	VON
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD) - OUTER DOOR	626	SCH
1	EA	PUSH PLATE	8200 4" X 16" TORX - INNER DOOR	630	IVE
1	EA	PULL PLATE	8305 10" 4" X 16" TORX - INNER DOOR	630	IVE
1	EA	H-SEC SURFACE CLOSER	4510T MC TORX (PULL SIDE MOUNT) - OUTER DOOR	689	LCN
1	EA	H-SEC SURFACE CLOSER	4510T MCSRI TORX (PULL SIDE MOUNT) - INNER DOOR	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX - INNER DOOR	626	IVE
2	EA	GASKETING	488SBK PSA ZAG	BK	ZER

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO UNLOCK THE PULL SIDE LEVER AND SHUNT ANY ALARMS ASSOCIATED WITH THE DOOR
6 CONTACT AND THE LX SWITCH INSIDE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE.
7 KEYED INGRESS IS ALSO AVAILABLE.

8

9 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

10 1) CREDENTIAL READER DEVICE.

11 2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK, THE DOOR CONTACT, AND THE LX-RX SWITCHES INSIDE THE
12 ELECTRIFIED LOCK.

13

1 Hardware Group No. 29

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	STOREROOM LOCK	L9080BD SL1 XL12-482	630	SCH
			- VERIFY THAT LEVERS WILL NOT HIT ONE ANOTHER		
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

3

4 Hardware Group No. 30

5 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	PASSAGE SET	L9010 SL1 XL12-482	630	SCH
1	EA	H-SEC SURFACE CLOSER	4510T MC TORX (PULL SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

6

7 Hardware Group No. 31

8 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	PASSAGE SET	L9010 SL1 XL12-482	630	SCH
1	EA	H-SEC SURFACE CLOSER	4210T CUSH MC TORX (PUSH SIDE MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

9

10 Hardware Group No. 32

11 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY	628	IVE
1	EA	PASSAGE SET	ND10S ATH	626	SCH
1	EA	SURFACE CLOSER	4040XP CUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

12

1 Hardware Group No. 33

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80BD ATH	626	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	WIRE HARNESS	CON-XX X REQUIRED LENGTH		SCH

3 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

4

5 CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
6 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

7

8 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

9 1) CREDENTIAL READER DEVICE.

10 2) REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE.

11

12 Hardware Group No. 34

13 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM W/DEADBOLT W/ OUTSIDE INDICATOR	L9480BD 07A L583-363 OS-OCC RX LX	630	SCH
1	EA	SFIC CORE	80-037 (FIELD VERIFY CORE TYPE AND KEYWAY REQD)	626	SCH
1	EA	ELECTRIC STRIKE	55 - D	630	SDC
1	EA	WALL STOP	WS406/407CCV	630	IVE

14 OPENING TO FAIL SECURE IN THE EVENT OF A FIRE.

15

16 CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIC STRIKE ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS
17 AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

18

19 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

20 1) CREDENTIAL READER DEVICE.

21 2) REQUIRED POWER AND WIRING TO THE ELECTRIC STRIKE.

22

1 Hardware Group No. 35

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	PIVOT SET	7255J SET	626	IVE
1	EA	PRIVACY W/COIN TURN	L9044 HSLR 09-662 10-072	630	SCH
1	EA	RESCUE STRIKE WITH KEYED EMERGENCY STOP	ADL-CEK	630	ACC
1	EA	OH STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS TKTX	630	IVE
2	SET	EDGE SEAL SET	34AA X TORX SCREWS	AL	ZER

3

4 Hardware Group No. 36

5 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	PRIVACY W/COIN TURN W/ OUTSIDE INDICATOR	L9044 07A L583-363 OS-OCC TORX	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS TKTX	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS TKTX	630	IVE
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

6

7 Hardware Group No. 37

8 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY W/COIN TURN W/ OUTSIDE INDICATOR	L9044 07A L583-363 OS-OCC TORX	630	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

9

10 Hardware Group No. 38

11 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	ND40S ATH	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	MOP PLATE	8400 4" X 1" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

12

1 Hardware Group No. 39

2 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	ND10S ATH	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA ZAG	BK	ZER

3

4 Hardware Group No. 40

5 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700-HT SECHM	630	IVE
1	EA	PASSAGE SET	L9010 SL1 XL12-482	630	SCH
1	EA	WALL STOP/HOLDER	WS406/407CVX TORX	626	IVE
1	EA	GASKETING	328AA-S X SECURITY SCREWS	628	ZER
1	EA	DOOR BOTTOM	367AA6 X SECURITY SCREWS	628	ZER

6

7 Hardware Group No. 41

8 Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	WEATHERIZED EXIT DEVICE	10XW - EXIT ONLY	626	DET
1	EA	DOOR CONTACT	7766	628	SCE

9 ALL OTHER HARDWARE TO BE SUPLIED BY THE GATE MANUFACTURER.

10

11 OPENING TO BE MONITORED ONLY.

12

13 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

14 1) REQUIRED POWER AND WIRING TO THE DOOR CONTACT.

15

16 Hardware Group No. 42

17 Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	DOOR CONTACT	674-OH	628	SCE
1	EA	NOTE:	ALL OTHER HARDWARE BY DOOR SUPPLIER	UNF	MIS

18 OPENING TO BE MONITORED WITH THE DOOR CONTACT. ELECTRIC LIFT AND ACCESS CONTROL KEYSWITCH PROVIDED BY

19 OTHERS.

20

21 ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:

22 1) ACCESS CONTROL AND KEYSWITCH.

23 2) REQUIRED POWER AND WIRING TO THE DOOR CONTACT AND THE OTHER COMPONENTS TO THE ACCESS CONTROL SYSTEM.

24

25 Hardware Group No. 43

26 Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	NOTE	ALL HARDWARE BY DOOR SUPPLIER	UNF	MIS

27

1

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Types of work in this Section include glass and glazing for:
 - a. Float Glass.
 - b. Tempered Glass.
 - c. Insulated Units.
 - d. Fire Rated Safety Glass.

1.2 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections:
 - 1. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions.
 - 2. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.
- B. Samples: Submit, for verification purposes, 12" square samples of each type of glass indicated except for clear single pane units, and 12" long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative of adjoining framing system in color. Sample requirement may be waived by Owner's Representative at their discretion.
- C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1.3 QUALITY ASSURANCE

- A. Glazing Standards: Comply with recommendations of the Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council (SGCC) or another certification agency acceptable to authorities having jurisdiction.
- C. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
- D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council, Inc..
- E. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.
- F. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).

1 **1.4 DELIVERY, STORAGE, AND HANDLING**

- 2 A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions
3 and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of
4 moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

5
6 **1.5 PROJECT CONDITIONS**

- 7 A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are
8 outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost,
9 condensation or other causes.

10
11 **1.6 WARRANTY**

- 12 A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the
13 Contract Documents.
14 B. All material shall be free from manufacturer defects and installation workmanship. Any material or workmanship
15 judged to be defective shall be replaced at no cost to the Owner.
16 C. Insulating glass units shall be jointly guaranteed for a period of ten (10) years by the manufacturer and installer
17 against obstruction of vision between interior glass surfaces caused by failure of the hermetic seal. Units damaged
18 during guarantee period shall be replaced at no cost to the Owner.

19
20 **PART 2 PRODUCTS**

21
22 **2.1 ACCEPTABLE GLASS MANUFACTURERS**

- 23 A. Subject to compliance with requirements, provide products by one of the following:
24 1. Cardinal Glass Industries, Inc. – Basis-of-design.
25 2. Guardian Glass LLC.
26 3. Pilkington North America; NSG Group.
27 4. Or approved equal.
28 B. All glass shall be new material, graded under ASTM 1036.
29 C. All glass in related area shall be from one manufacturer.

30
31 **2.2 GLASS MATERIALS**

- 32 A. Refer to Drawings for location of glass.
33 B. Clear Float Glass: ASTM C1036, Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select).
34 C. Tempered Glass: 1/4", Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3,
35 clear, fully tempered safety glass (meet requirements of ANSI Z97.1).
36 1. All tempered glass shall conform to ANSI Z97.1, ASTM C1048, and Federal Standard CPSC 16 CFR 1201.
37 Tempered glass shall bear permanent monogram indicating tempered quality. Fabrication marks on
38 tempered glass shall be located to be concealed in completed installation.
39 D. Coated Low Emissivity
40 1. Clear Glass: 1/4", Condition C (other coated glass), Type I (transparent glass, flat), Class I (clear), Quality q3
41 (glazing select), with coating type and performance characteristics complying with requirements specified
42 below.
43 2. Tinted Glass: ASTM C1036, Type I, Class 2 (tinted), Quality q3 and performance characteristics complying with
44 requirements specified below.
45 a. Color and Tint: See Drawings.
46 b. Performance Requirements:
47 1) SHGC: 0.3.
48 2) U-value: 0.29.
49 3) Reflectance: 8.
50 3. Low E Coating: Solarban 60: Side 2 or 3 on insulated units.

E. Sealed Insulating Glass Units

1. Provide preassembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for performance classification indicated as well as with other requirements specified for glass characteristics, air, space, sealing system, sealant, space material, and desiccants.
 - a. Thickness of Each Pane: 1/4".
 - b. Air Space Thickness: 1/2".
 - c. Sealing System: Manufacturer's Standard Dual Seal.
 - d. Desiccant: Manufacturer's Standard - Either Molecular Sieve or Silica Gel or Blend of Both.
 - e. Spacer Material: Manufacturer's Standard Metal, with Bronze Anodized Finish.
2. Basis-of-Design Product: Cardinal Glass; LoE-366 coating on surface 2, LoE-i89 coating on surface 3, Endur IG spacer.

2.3 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.
 3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for Type, Grade, Class and Uses.
 4. Colors: Provide color of exposed sealants indicated or, if not otherwise indicated, as selected by Owner's Representative from manufacturer's standard colors.
- B. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA 800-08; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.
- C. Sealants: Provide structural and weatherseal sealants recommended by the manufacturer of the glazing system.
1. Refer to Section 07 9200 for requirements.
- D. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Provide the curtain wall manufacturer's permanent nonmigrating types compatible with sealants and suitable for joint movement and sealing requirements.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
- E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25 percent deflection.

PART 3 EXECUTION

1 **3.1 EXAMINATION**

- 2 A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation
3 tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system;
4 for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's
5 written report listing conditions detrimental to performance of glazing work.
6 1. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

7
8 **3.2 PREPARATION**

- 9 A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings
10 which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are
11 indicated for use.

12
13 **3.3 GLAZING, GENERAL**

- 14 A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets
15 and other glazing materials, except where more stringent requirements are indicated, including those of referenced
16 glazing standards.
17 B. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent
18 damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within
19 openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge
20 which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project
21 and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and
22 impairs performance and appearance.
23 C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-
24 substrate testing.
25 D. Anchor components securely in place in the manner indicated. Shim and allow for movement resulting from
26 changes in thermal conditions. Provide separators and isolators to prevent corrosion, electrolytic deterioration,
27 and "freeze-up" of moving joints.
28 E. Glazing: Inspect glass and framing for compliance with manufacturing and installation tolerances, including size,
29 squareness, and offsets at corners; for existence of minimum face or edge clearances; and for effective sealing of
30 joinery.
31 1. Avoid point loading of glass. Do not proceed with glazing work until unsatisfactory conditions have been
32 corrected. Do not field-cut glass.
33 2. Field-Glazed Structural Silicone Glazing Work: Clean frames and glass surfaces with an approved solvent.
34 Prime surfaces and apply structural sealant in accordance with manufacturer's recommendations. Clean
35 excess structural sealant before curing. Mechanically hold glass firmly in place until sealant is sufficiently
36 cured. Install compressible backer rods in joint before applying weatherseal sealant.
37 F. Erection Tolerances: Install curtain wall components plumb, level, accurately aligned, and located in reference to
38 column lines and floor levels. Erection tolerances indicated below are the maximum allowable for both no-load
39 and full-load conditions and are not cumulative. Adjust work to conform to the following tolerances:
40 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
41 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
42 3. Alignment: Limit offset of member alignment to 1/16 inch where surfaces are flush or less than 1/2 inch out
43 of flush and separated by less than 3 inches by protruding work; otherwise limit offsets to 1/8 inch.
44 4. Location: 3/8 inch maximum deviation from the measured theoretical location of any member at any
45 location.

46
47 **3.4 GLAZING INSTALLATION**

- 48 A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge
49 nearest corner not closer than 6" from corner, unless otherwise required. Set blocks in thin course of sealant which
50 is acceptable for heel bead use.
51 B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger
52 than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are
53 used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except
54 with sealant tape use thickness slightly less than final compressed thickness of tape.

- 1 C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise
2 required by glass unit manufacturer. Set units of glass in each series with uniformity of pattern, draw, bow and
3 similar characteristics.
- 4 D. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass
5 manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back
6 surface as well as to control depth of sealant for optimum performance, unless otherwise indicated. Force sealants
7 into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel
8 surfaces.

9
10 **3.5 FIRE-RESISTANT GLAZING SCHEDULE**

- 11 A. 20-minute fire-protection-rated glazing without hose-stream test; fire-protection rated tempered glass.
- 12 B. 45-minute fire-protection-rated glazing; film-faced ceramic glazing.
- 13 C. 60-minute fire-protection-rated glazing with 450 deg F temperature-rise limitation; laminated glass with
14 intumescent interlayers.
- 15 D. 90-minute fire-resistance-rated glazing with 450 deg F temperature-rise limitation; laminated glass with
16 intumescent interlayers.

17
18 **3.6 PROTECTION AND CLEANING**

- 19 A. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing
20 and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean
21 surfaces.
- 22 B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such
23 protection, contaminating substances do come into contact with glass, remove immediately by method
24 recommended by glass manufacturer.
- 25 C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals
26 during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining.
27 When examination reveals presence of these forms of residue, remove by method recommended by glass
28 manufacturer.
- 29 D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction
30 period, including natural causes, accidents and vandalism.
- 31 E. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date
32 of substantial completion.

33
34 **END OF SECTION**

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**SECTION 08 83 00
MIRRORS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Annealed monolithic glass mirrors.

1.2 SUBMITTALS

- A. Product Data: For mirrors and mounting hardware.

1.3 QUALITY ASSURANCE

- A. Glazing Publications: Comply with GANA's "Glazing Manual" and GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors" unless more stringent requirements are indicated
- B. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated in second subparagraph below.
 - 1. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRROR MATERIALS

- A. Clear Glass Mirrors: ASTM C 1503, Mirror Glazing Quality.
 - 1. Nominal Thickness: 4.0 mm.

2.2 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

2.3 MIRROR HARDWARE

- A. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- B. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

- A. Mirror Edge Treatment: Flat polished edge.
 - 1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.
 - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

1 **PART 3 - EXECUTION**

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3 **3.1 INSTALLATION**

4 A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA
5 publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

6 B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between
7 back of mirrors and face of mounting surface.

8 C. For wall-mounted mirrors, install with mirror hardware.

9 1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or
10 inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

11 2. For metal or plastic clips, place a felt or plastic pad between mirror and each clip to prevent spalling of mirror
12 edges.

13 3. Where indicated, install bottom and top clips at locations indicated or, if locations are not indicated, install
14 bottom and top clips symmetrically placed and evenly spaced

15 D. Protect mirrors from breakage and contaminating substances resulting from construction operations.

16 E. Do not permit edges of mirrors to be exposed to standing water.

17 F. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or
18 other sources for continuous periods of time.

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END OF SECTION

**SECTION 08 87 26
BIRD CONTROL FILM**

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PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Bird Control polyester film field applied to existing glass.

1.2 PERFORMANCE REQUIREMENTS

- A. Bird Collision: Meets “tunnel testing” requirements with a Threat Factor (TF) of ≤ 30
- B. Flammability: Meets surface burning characteristics in accordance with ASTM E-84 Class A
 - 1. Flame Spread Index = < 25
 - 2. Smoke Development Index = < 450

1.3 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Independent accredited testing agency reports showing compliance with specified tests in section 1.3.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- B. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- C. Manufacturer's warranty information.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Products specified shall be a standard product of a manufacturer regularly engaged in the manufacturing and distribution of such products for a minimum of 10 years.
- B. Installer Qualifications: Documented experience in the application of self-adhesive window films with at least 3 applications of similar size and complexity, and approved by the window film manufacturer.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Apply film to one window designated by Architect.
 - 2. Do not proceed with remaining work until workmanship and color, is approved by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products indoors in manufacturer's unopened packaging until ready for installation.
- B. Dispose of any hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Provide film manufacturer's limited warranty against adhesive failure, bubbling, peeling, or other manufacturer's defect;
- B. Duration of warranty shall be as follows:
 - 1. Modern Bird Strike Films- Five (5) Year Limited Warranty

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide Solar Gard film by Solar Gard-Saint Gobain, or comparable products by one of the following:
 - 1. Convenience Group, Inc.
 - 2. FeatherFriendly.
 - 3. Or approved equal.

- 1 **2.2 MODERN BIRD STRIKE FILMS**
2 A. Solar Gard Modern Bird Strike Dot film with pressure sensitive adhesive shall have the following nominal
3 properties when applied to 1/4 inch (6 mm) clear glass.
4 1. Threat Factor assigned: 15
5 2. Film Performance Results, Nominal
6 a. Film Appearance: Clear with a Dotted Pattern
7 b. Visible Light Transmittance: 88 percent
8 c. Visible Reflectance (glass side): 9
9 d. Visible Reflectance (film side): 9
10 e. Glare Reduction: 1 percent
11 f. Solar Heat Gain Coefficient: .78
12 g. Ultraviolet Light Blocked (300-380 nanometers): > 99 percent
13

14 **PART 3 EXECUTION**

15 **3.1 EXAMINATION**

- 16 A. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation
17 before proceeding.
18 B. Glass surfaces should be inspected for defects including scratches or defects which will affect the final
19 appearance.
20 C. Do not begin installation until substrates have been properly inspected.

21 **3.2 PREPARATION**

- 22 A. Clean surfaces thoroughly prior to installation.
23 B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the
24 substrate under the project conditions.

25 **3.3 INSTALLATION**

- 26 A. Install in accordance with manufacturer's instructions. Installation must be accomplished by a recognized
27 professional installer of film for energy control purposes or safety and security purposes. Completed work must
28 meet IWFA visual acceptance standard.
29 B. Install without bubbles, ripples, drips, dirt, cuts, tears or gaps between film and frame.
30 C. Clean newly installed film and window frames after installation.
31 D. Clean up cleaning solutions, run-off cleaning water and adhesive mounting solution.

32 **3.4 PROTECTION**

- 33 A. Protect installed products until completion of project.
34 B. Where installed film could be damaged by subsequent construction provide tape warning strips or barricades to
35 prevent contact.

36

37

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.
- B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ClarkDietrich.
 - b. MBA Building Supplies.
 - c. Steel Network, Inc.
 - d. Telling Industries.
 - e. Or approved equal.
 - 2. Unless indicated otherwise, use 25 gauge for partitions up to 12'-0" high. Partitions over 12'-0" high increase stud gage to 20 gauge.
 - 3. Unless indicated otherwise, use 20 gauge studs at door jambs and heads.
- C. Slip-Type Head Joints: Where indicated, provide one of the following in thickness not less than indicated for studs and in width to accommodate depth of studs:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch-deep flanges, 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 C 645 top runners, inside runner with 2-inch-deep flanges 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 due to deflection of structure above.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track.
 - 3) Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track or Vertical Slip Track II.
 - 6) Approved equal.
- D. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- 1 a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
- 2 b. Grace Construction Products; FlameSafe FlowTrak System.
- 3 c. Metal-Lite, Inc.; The System.
- 4 d. Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.
- 5 e. Approved equal.
- 6 E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
- 7 1. Minimum Base-Metal Thickness: As indicated on Drawings.
- 8 F. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide
- 9 flanges.
- 10 1. Depth: As indicated on Drawings.
- 11 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- 12 G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- 13 1. Minimum Base-Metal Thickness: As indicated on Drawings.
- 14 2. Depth: As indicated on Drawings.
- 15 H. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
- 16 1. Configuration: Asymmetrical or hat shaped.
- 17 I. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
- 18 1. Depth: As indicated on Drawings.
- 19 2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of
- 20 0.033 inch.
- 21 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand
- 22 of 0.048-inch- diameter wire.
- 23 J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch,
- 24 minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.
- 25

2.3 SUSPENSION SYSTEMS

- 26
- 27 A. Suspended Ceiling Framing:
- 28 1. Tie Wire: ASTM A 641/A 641 M, Class 1 zinc coating, soft temper, 0.0625-inch diameter, or double strand of
- 29 0.0475-inch diameter wire.
- 30 2. Wire Hangers: ASTM A 641/A 641 M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
- 31 3. Carrying Channels: Cold-rolled steel, 0.0538 inch thick, 1-1/2 inches deep.
- 32 4. Furring Channels: 3/4-inch deep, cold-rolled channels, 0.0538 inch thick.
- 33 5. Grid Suspension System for Interior Ceilings: Interlocking, direct-hung system.
- 34

2.4 AUXILIARY MATERIALS

- 35
- 36 A. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other
- 37 properties required to fasten steel framing and furring members securely to substrates involved; complying with the
- 38 recommendations of gypsum board manufacturers for applications indicated.
- 39 B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt.
- 40

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- 41
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- 44 A. Installation Standard: ASTM C 754.
- 45 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
- 46 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing
- 47 installation.
- 48 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing
- 49 installation.
- 50 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- 51 B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet
- 52 accessories, furnishings, or similar construction.
- 53 C. Install bracing at terminations in assemblies.
- 54 D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides
- 55 of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- 56
- 57 A. Install framing system components according to spacings indicated, but not greater than spacings required by
- 58 referenced installation standards for assembly types.

- 1 B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation
2 strip between studs and exterior wall.
- 3 C. Install studs so flanges within framing system point in same direction.
- 4 D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates
5 above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue
6 framing around ducts penetrating partitions above ceiling.
 - 7 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at
8 tops of framing systems that prevent axial loading of finished assemblies.
 - 9 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section
10 (for cripple studs) at head and secure to jamb studs.
 - 11 a. Install two studs at each jamb unless otherwise indicated.
 - 12 b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from
13 jamb stud to allow for installation of control joint in finished assembly.
 - 14 c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 15 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings
16 unless otherwise indicated. Install framing below sills of openings to match framing required above door
17 heads.
 - 18 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and
19 support closures and to make partitions continuous from floor to underside of solid structure.
 - 20 a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly
21 indicated.
 - 22 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 23 6. Curved Partitions:
 - 24 a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - 25 b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight
26 lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- 27 E. Direct Furring:
 - 28 1. Screw to wood framing.
 - 29 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven
30 fasteners spaced 24 inches o.c.
- 31 F. Z-Furring Members:
 - 32 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
 - 33 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails,
34 screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
 - 35 3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner;
36 on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior
37 corners, space second member no more than 12 inches from corner and cut insulation to fit.
- 38 G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane
39 formed by faces of adjacent framing.

40
41 **3.3 INSTALLING SUSPENSION SYSTEMS**

- 42 A. Install suspension system components according to spacings indicated, but not greater than spacings required by
43 referenced installation standards for assembly types.
- 44 B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to
45 prevent transfer of loading imposed by structural movement.
- 46 C. Suspend hangers from building structure as follows:
 - 47 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are
48 not part of supporting structural or suspension system.
 - 49 a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by
50 bracing, countersplaying, or other equally effective means.
 - 51 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere
52 with locations of hangers, install supplemental suspension members and hangers in the form of trapezes or
53 equivalent devices.
 - 54 3. Do not attach hangers to steel roof deck.
 - 55 4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through
56 forms.
 - 57 5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - 58 6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

- 1 D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- 2 E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- 3 F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise
- 4 on each member that will receive finishes and transversely between parallel members that will receive finishes.
- 5
- 6

END OF SECTION

**SECTION 09 29 00
GYPSUM BOARD**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Sound attenuation blankets.
3. Acoustical sealant.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
- C. Sustainable Design Submittals:
1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
 3. Environmental Product Declarations: For each product.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- D. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- E. Any piping with insulation shall be boxed out (furred out) even if not shown to be concealed on the Drawings.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Gypsum, Gold Bond.
 - b. USG, EcoSmart.
 - c. Georgia Pacific, ToughRock.
 - d. Or approved equal.
- B. Type X:
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- C. Type C (as required by specific UL assemblies):
1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
- D. Impact-Resistant Type:
1. Manufacturers:
 - a. USG
 - b. Georgia Pacific

- 1 c. Approved Equal
- 2 2. Standard: ASTM C1629.
- 3 3. Classification Level: See Drawings.
- 4 E. Acoustic Gypsum Board:
- 5 1. Manufacturers:
- 6 a. QuietRock.
- 7 b. CertainTeed.
- 8 c. Armstrong.
- 9 d. Approved Equal.
- 10 2. STC Requirements: See Drawings.

11
12 **2.2 TILE BACKING PANELS**

- 13 A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
- 14 1. Manufacturers:
- 15 a. C-Cure.
- 16 b. Custom Building Products.
- 17 c. USG Corporation.
- 18 d. Approved equal.
- 19 2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

20
21 **2.3 JOINT TREATMENT MATERIALS**

- 22 A. General: Comply with ASTM C 475/C 475M.
- 23 B. Joint Tape:
- 24 1. Interior Gypsum Wallboard: Paper.
- 25 C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other
- 26 compounds applied on previous or for successive coats.
- 27 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type
- 28 taping compound.
- 29 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use
- 30 setting-type taping compound.
- 31 a. Use setting-type compound for installing paper-faced metal trim accessories.
- 32 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
- 33 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
- 34 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

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37 **2.4 TEXTURED FINISHES**

- 38 A. Primer: As recommended by textured finish manufacturer.
- 39 B. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
- 40 1. Products: Subject to compliance with requirements, provide one of the following:
- 41 a. G-P Gypsum; Georgia-Pacific Ceiling Textures/Vermiculite.
- 42 b. USG Corporation; SHEETROCK Wall and Ceiling Spray Texture (Aggregated).
- 43 2. Texture: Light orange peel.

44
45
46 **2.5 TRIM ACCESSORIES**

- 47 A. Interior Trim: ASTM C 1047.
- 48 1. Material: Galvanized or aluminum-coated steel sheet, or rolled zinc.
- 49 2. Shapes:
- 50 a. Cornerbead.
- 51 b. Bullnose bead.
- 52 c. LC-Bead: J-shaped; exposed long flange receives joint compound.
- 53 d. U-Bead: J-shaped; exposed short flange does not receive joints compound.
- 54 Expansion (control) joint.
- 55 B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
- 56 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 57 a. Fry Reglet Corp.
- 58 b. Gordon, Inc.

- 1 c. Pittcon Industries.
- 2
- 3 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy
- 4 6063-T5.
- 5 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials.
- 6

7 **2.6 AUXILIARY MATERIALS**

- 8 A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written
- 9 recommendations.
- 10 B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous
- 11 substrate.
- 12 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D
- 13 (EPA Method 24).
- 14 C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- 15 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- 16 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- 17 D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining
- 18 thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- 19 E. Acoustical Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints
- 20 and openings as demonstrated by testing according to ASTM E 90.
- 21 1. Products: Subject to compliance with requirements, provide acoustical joint sealant by one of the following
- 22 manufacturers:
- 23 a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
- 24 b. Grabber Construction Products; Acoustical Sealant GSC.
- 25 c. Pecora Corporation; AC-20 FTR.
- 26 d. Specified Technologies Inc.; Smke N Sound Acoustical Sealant.
- 27 e. USG Corporation; SHEETROCK Acoustical Sealant.
- 28 f. Approved Equal.
- 29 2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59,
- 30 Subpart D (EPA Method 24).
- 31 F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- 32 G. Vapor Retarder: As specified in Division 07 Section "Fluid-Applied Membrane Air Barriers."
- 33

34 **PART 3 - EXECUTION**

35

36 **3.1 APPLYING AND FINISHING PANELS, GENERAL**

- 37 A. Comply with ASTM C 840.
- 38 B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- 39 C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors.
- 40 Provide 1/4- to 1/2-inch wide spaces at these locations, and trim edges with edge trim where edges of panels are
- 41 exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- 42 D. All partitions are to run tight to structure; there may be exceptions noted in the Drawings.
- 43 E. If pipes and cuts above ceiling preclude walls or partitions from going full to structure, Contractor shall provide an
- 44 alternate measure acceptable to Architect at no additional cost. Examples include lath and plaster or other means of
- 45 preventing the passage of smoke and/or fire.
- 46 F. Bulkheads required for piping, etc. will require framing and sheet rock on one or both sides where piping is below
- 47 typical ceiling heights.
- 48

49 **3.2 APPLYING INTERIOR GYPSUM BOARD**

- 50 A. Install interior gypsum board in the following locations:
- 51 1. Type X: All locations, unless noted otherwise.
- 52 2. Impact-Resistant: As indicated on Drawings.

53 **3.3 INSTALLATION OF TILE BACKING PANELS**

- 54 A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written instructions and install at locations
- 55 indicated to received tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- 56

- 1 **3.4 INSTALLATION OF INSULATION FOR SOUND ATTENUATION**
2 A. Install 3-inch thick, unfaced glass-fiber blanket insulation over suspended ceilings at partitions in a width that extends
3 insulation 48 inches on either side of partition
4 B. Install unfaced, glass-fiber blanket insulation in walls, as shown on Drawings.
5

- 6 **3.5 APPLYING ACOUSTICAL SEALANT**
7 A. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in
8 acoustical applications as applicable to materials, applications, and conditions indicated.
9

- 10 **3.6 INSTALLING TRIM ACCESSORIES**
11 A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels.
12 Otherwise, attach trim according to manufacturer's written instructions.
13 B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual
14 effect.
15 C. Interior Trim: Install in the following locations:
16
17 1. Cornerbead: Use at outside corners.
18 2. Bullnose Bead: Use at outside corners.
19 3. LC-Bead: Use where indicated.
20 4. U-Bead: Use where indicated.
21 D. Aluminum Trim: Install in locations indicated on Drawings.
22

- 23 **3.7 FINISHING GYPSUM BOARD**
24 A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface
25 defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint
26 compound from adjacent surfaces.
27 B. Prefill open joints, beveled edges, and damaged surface areas.
28 C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
29 D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
30 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
31 2. Level 2: Panels that are substrate for tile.
32 3. Level 3: Where indicated on Drawings.
33 4. Level 4: At panel surfaces that will be exposed to view and under wall coverings, unless otherwise
34 indicated.
35 a. Primer and its application to surfaces are specified in Section 09 9123 "Interior Painting."
36 5. Level 5: Where indicated on Drawings and elsewhere in Specifications.
37 a. Primer and its application to surfaces are specified in Section 09 9123 "Interior Painting."
38

- 39 **3.8 PROTECTION**
40 A. Protect adjacent surfaces from drywall compound and finishes and promptly remove from floors and other non-
41 drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall installation.
42 B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes
43 during remainder of the construction period.
44 C. Remove and replace panels that are wet, moisture damaged, or mold damaged.
45 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging,
46 or irregular shape.
47 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface
48 contamination and discoloration.
49

50 **END OF SECTION**

**SECTION 09 30 00
TILING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Porcelain floor, wall, and base tile.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants."
 - 2. Division 09 Section "Gypsum Board" for tile backing panels.

1.2 REFERENCES

- A. The following specifications and standards are incorporated by reference:
 - 1. TCNA (Tile Council of North America, Inc.) Handbook for Ceramic, Porcelain, Glass, and Stone Tile Installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples: Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
- D. Grout samples in duplicate indicating color range anticipated, texture.
- E. Material Test Reports: For each tile-setting and -grouting product.
- F. Sustainable Design Submittals:
 - 1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
 - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
 - 1. Joint sealants.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.
- E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type,
2 composition, color, pattern, and size.

3
4 **PART 2 - PRODUCTS**

5
6 **2.1 GENERAL**

- 7 A. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in
8 factory and package so tile units taken from one package show same range in colors as those taken from other
9 packages and match approved Samples.
10 B. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer,
11 unless otherwise indicated.
12 C. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile
13 against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot.
14 Do not coat unexposed tile surfaces.

15
16 **2.2 TILE**

- 17 A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be
18 incorporated into the Work include, but are not limited to, the following:
19 1. American Olean; a brand of Dal-Tile Corporation.
20 2. Atlas Concorde USA.
21 3. Crossville, Inc.
22 4. Wausau Tile.
23 5. Or as indicated on the Drawings.
24 B. Colors: See Room Finish Schedule and Finish List.
25 C. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types,
26 compositions, and other characteristics indicated.
27 D. Shower Tile Slabs: Wausau Tile, 3/8" thick epoxy terrazzo floor tile, 2-foot by 3-foot and 3-foot by 4-foot as needed
28 to minimize grouting.
29 1. Anti-Slip Sealer: My manufacturer.
30 E. Shower Cove Base: Wausau Tile, 6-inch coved base, 3/8" thick, precast epoxy with polished finish.

31
32 **2.3 ACCESSORY MATERIALS**

- 33 A. Thresholds:
34 1. Fabricate to provide transition between adjacent floor finishes. Bevel edges at 1:2 slope, limit height of bevel
35 to 1/2 inch or less, and finish bevel to match face of threshold.

36
37 **2.4 SETTING AND GROUTING MATERIALS**

- 38 A. Manufacturers:
39 1. Atlas Minerals & Chemicals, Inc.
40 2. Boiardi Products Corporation.
41 3. Bonsal, W. R., Company.
42 4. Bostik.
43 5. C-Cure.
44 6. Custom Building Products.
45 7. DAP, Inc.
46 8. Jamo Inc.
47 9. LATICRETE International Inc.
48 10. MAPEI Corporation.
49 11. Southern Grouts & Mortars, Inc.
50 12. Summitville Tiles, Inc.
51 13. TEC Specialty Products Inc.
52
53 B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:
54 1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water
55 must be added at Project site.
56 2. Prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive
57 at Project site.

- 1 3. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to
- 2 the other requirements in ANSI A118.4.
- 3 C. Organic Adhesive: ANSI A136.1, Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59,
- 4 Subpart D (EPA Method 24).
- 5 D. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3, with a VOC content of 65 g/L or less when calculated
- 6 according to 40 CFR 59, Subpart D (EPA Method 24).
- 7 E. Standard Sanded Cement Grout: ANSI A118.6, color as selected by Owner.
- 8 F. Epoxy Grout, Water-Cleanable: ANSI A118.3.
- 9 1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140
- 10 deg F and 212 deg F, respectively, and certified by manufacturer for intended use.
- 11 G. Polymer-Modified Tile Grout: ANSI A118.7. Use sanded grout for joints 1/8 inch and wider and unsanded grout for
- 12 joints narrower than 1/8 inch.
- 13 1. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-
- 14 grout mix.
- 15 2. Color: See Drawings.
- 16 H. Expansion Joints:
- 17 1. Sealant: Two-component sealant shall comply with Federal Specification TT-S-227e; use Type II (non-sag) for
- 18 joints in vertical surfaces and Type I (self-leveling) for joints in horizontal surfaces.
- 19 2. Floors: Shore A hardness greater than 35.
- 20 3. Back-Up Strips: Flexible and compressible type of closed-cell foam polyethylene or butyl rubber, rounded at
- 21 surface to contact sealant and as recommended by sealant manufacturers.
- 22 I. Provide other materials not specifically described but required for a complete and proper installation.
- 23 Retain one or both subparagraphs below with any of three subparagraphs above.
- 24

25 2.5 ELASTOMERIC SEALANTS

- 26 A. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as
- 27 applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic
- 28 tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme
- 29 temperatures.
- 30 1. Products:
- 31 a. Dow Corning Corporation; Dow Corning 786.
- 32 b. GE Silicones; Sanitary 1700.
- 33 c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
- 34 d. Tremco, Inc.; Tremsil 600 White.
- 35

36 2.6 UNCOUPLING MEMBRANE

- 37 A. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is
- 38 recommended by the manufacturer for the application indicated. Include reinforcement and accessories
- 39 recommended by manufacturer.
- 40 B. Corrugated Polyethylene: Corrugated polyethylene with dovetail-shaped corrugations and with anchoring webbing
- 41 on the underside; 3/16-inch nominal thickness.
- 42 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available
- 43 manufacturers offering products that may be incorporated into the Work include, but are not limited to, the
- 44 following:
- 45 a. Laticrete International, Inc.
- 46 b. MAPEI Corporation.
- 47 c. Schluter Systems.
- 48 d. Approved equal. Insert other sealant products, including chemical-resistant sealants, as required. See
- 49 Division 7 Section "Joint Sealants."
- 50

51 2.7 WATERPROOFING MEMBRANE

- 52 A. Manufacturers: Subject to compliance with requirements, provide 9235 Waterproofing Membrane by Laticrete, or
- 53 comparable product by one of the following:
- 54 1. MAPEI Corporation; Shower Waterproofing Kit.
- 55 2. Schluter Systems; Kerdi.
- 56 3. Or approved equal.
- 57

1 **2.8 MISCELLANEOUS MATERIALS**

- 2 A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided
3 or approved by manufacturer of tile-setting materials for installations indicated.
- 4 B. Cementitious Backer Units: ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.
- 5 1. Interior Products: Subject to compliance with requirements, provide one of the following:
6 a. C-Cure; C-Cure Board 990.
7 b. Custom Building Products; Wonderboard.
8 c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
9 d. USG Corporation; DUROCK Cement Board.
- 10 2. Exterior Products: Subject to compliance with requirements, provide Wedi Building Board, or comparable
11 product by one of the following:
12 a. Laticrete Hydroban Board.
13 b. Or approved equal.
- 14 3. Thickness: As indicated.
- 15 C. Metal Edge Trim: Profile designed for wall terminations and edge protection.
- 16 1. Basis-on-Design Manufacturer: Schluter Systems L.P.
17 2. Locations: See Drawings.
18 3. Material and Finish: Polished chrome anodized aluminum.
- 19 D. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal
20 and PVC or neoprene base, designed specifically for flooring applications, nickel silver exposed-edge material.
- 21 E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces,
22 specifically approved for materials and installations indicated by tile and grout manufacturers.
- 23 F. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or
24 appearance of grout.
- 25 1. Products:
26 a. Bonsal, W. R., Company; Grout Sealer.
27 b. Bostik; CeramaSeal Grout Sealer.
28 c. C-Cure; Penetrating Sealer 978.
29 d. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
30 e. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
31 f. TEC Specialty Products Inc.; TA-256 Penetrating Silicone Grout Sealer.

32
33 **2.9 MIXING MORTARS AND GROUT**

- 34 A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written
35 instructions.
- 36 B. Add materials, water, and additives in accurate proportions.
- 37 C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to
38 produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
39

40 **PART 3 - EXECUTION**

41
42 **3.1 EXAMINATION**

- 43 A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with
44 requirements for installation tolerances and other conditions affecting performance of installed tile.
- 45 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and
46 within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for
47 installations indicated.
- 48 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and
49 similar items located in or behind tile has been completed before installing tile.
- 50 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated,
51 adjust joint locations in consultation with Architect.
- 52 B. Proceed with installation only after unsatisfactory conditions have been corrected.
53

54 **3.2 PREPARATION**

- 55 A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are
56 incompatible with tile-setting materials.
- 57 B. Provide concrete substrates for tile floors installed with adhesives or thin-set mortar that comply with flatness
58 tolerances specified in referenced ANSI A108 Series of tile installation standards.

- 1 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting
- 2 material manufacturer's written instructions. Use product specifically recommended by tile-setting material
- 3 manufacturer.
- 4 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- 5 C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been
- 6 factory blended and packaged so tile units taken from one package show same range of colors as those taken from
- 7 other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at
- 8 Project site before installing.
- 9

10 **3.3 INSTALLATION, GENERAL**

- 11 A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic
- 12 Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation
- 13 schedules.
- 14 B. TCNA Installation Guidelines: TCNA Handbook for Ceramic, Glass, and Stone Tile Installation. Comply with TCNA
- 15 installation methods indicated in ceramic tile installation schedules.
- 16 C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without
- 17 interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without
- 18 disrupting pattern or joint alignments.
- 19 D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces.
- 20 Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to
- 21 electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- 22 E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base,
- 23 walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall
- 24 area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- 25 F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
- 26 1. Floor Tile: 3/16 inch.
- 27 2. Wall Tile: 3/16 inch.
- 28 3. Base Tile: 3/16 inch.
- 29 G. Lay out tile wainscots to next full tile beyond dimensions indicated.
- 30 H. Rub exposed edges smooth.
- 31 I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush
- 32 with or below top of file.
- 33 J. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation
- 34 joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after
- 35 installing tiles.
- 36 1. Locate joints in tile surfaces directly above joints in concrete substrates.
- 37 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."
- 38 K. Grout tile to comply with requirements of the following tile installation standards:
- 39 1. For ceramic tile grouts (sand-portland cement; dry-set, commercial Portland cement; and latex-Portland
- 40 cement grouts), comply with ANSI A108.10.
- 41 2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
- 42 L. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11
- 43 and manufacturer's written instructions for type of application indicated.
- 44 M. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95
- 45 percent mortar coverage.
- 46 1. Tile floors in wet areas.
- 47 2. Tile floors composed of tiles 8 x 8 inches or larger.
- 48 3. Tile floors composed of rib-backed tiles.
- 49 N. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written
- 50 instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on
- 51 tile faces by wiping with soft cloth.
- 52

53 **3.4 CLEANING AND PROTECTING**

- 54 A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign
- 55 matter.
- 56 1. Remove epoxy and latex-Portland cement grout residue from tile as soon as possible.
- 57 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no
- 58 sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and

- 1 only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be
2 cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean
3 water before and after cleaning.
- 4 B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls, floors and
5 base. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent
6 staining, damage, and wear.
- 7 C. Close off work spaces to traffic during installation for at least 48 hours after completion of work.
- 8 D. Cover floors with clean building paper before foot traffic is permitted on them. Board walkways shall be placed on
9 floors that are to be continuously used as passageways by workers.
- 10 E. Tiled vertical outside corners shall be protected with board corner strips in areas used as passageways.
- 11 F. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

12
13

END OF SECTION

**SECTION 09 51 23
ACOUSTICAL TILE CEILINGS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes acoustical tiles and concealed suspension systems for ceilings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Drawn to scale and coordinating acoustical tile ceiling installation with hanger attachment to building structure and ceiling mounted items. Show size and location of initial access modules.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Tile: Set of 12 x 12-inch square Samples of each type, color, pattern, and texture.
 - 2. Submit two samples each, 6 inches long, of suspension system main runner.
- D. Product Test Reports.
- E. Maintenance Data.
- F. Sustainable Design Submittals:
 - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 2. Environmental Product Declarations: For acoustical ceiling tile.
 - 3. Health Product Declarations (HPD): For each product.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical tile ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- C. Certificates: Submit manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry the Underwriters Laboratories (UL) classification for NRC, CAC, and AC.

1.4 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size tiles equal to 3.0 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 3.0 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 3.0 percent of amount installed.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and have a stabilized moisture content within the acoustical tile unit manufacturer's recommended limitations.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete and nominally dry, work above ceilings is

1 complete and ambient conditions of temperature and humidity will be continuously maintained at values near those
2 indicated for final occupancy.
3

4 **1.7 COORDINATION**

- 5 A. Coordinate layout and installation of acoustical tiles, and suspension system components with other construction that
6 penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, sprinkler heads and other fire-
7 suppression system components, and partition assemblies.
8

9 **1.8 WARRANTY**

- 10 A. Written warranty executed by the manufacturer, agreeing to repair or replacement of acoustical ceilings that fail
11 within the warranty period. Failures include:
12 1. Acoustical Tiles: Sagging and warping.
13 2. Grid Systems: Rusting and manufacturer's defects.
14 B. Warranty Period for Acoustical Tiles: Minimum one year from date of Substantial Completion.
15 C. Warranty Period for Grid System: Minimum 10 years from date of Substantial Completion.
16 D. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract
17 Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the
18 requirements of the Contract Documents.
19

20 **PART 2 - PRODUCTS**

21
22 **2.1 ACOUSTICAL CEILING TILE**

- 23 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
24 1. Armstrong World Industries, Inc.
25 2. CertainTeed.
26 3. RPG Acoustic.
27 4. USG Corporation.
28 5. Or approved equal.
29 B. Products: See Room Finish Schedule and Finish List.
30

31 **2.2 ACOUSTICAL TILE CEILINGS, GENERAL**

- 32 A. Low-Emitting Materials: Acoustical tile ceilings shall comply with the testing and product requirements of the
33 California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from
34 Various Sources Using Small-Scale Environmental Chambers."
35 B. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 30
36 percent.
37 C. Acoustical Tile Standard: Comply with ASTM E 1264. Provide manufacturer's standard tiles of configuration indicated
38 that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light
39 reflectances, unless otherwise indicated.
40 D. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types,
41 structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
42 E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless
43 otherwise indicated.
44

45 **2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING**

- 46 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
47 1. Armstrong World Industries, Inc.
48 2. USG Interiors, Inc.
49 3. Chicago Metallic Corporation.
50 4. Approved Equal.
51 B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types,
52 structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
53 C. Access: Upward, with each access unit identified by manufacturer's standard unobtrusive markers.
54 D. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products"
55 for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish
56 for type of system indicated.
57

- 1 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe
- 2 Environment Performance" where high-humidity finishes are indicated.
- 3 E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless
- 4 otherwise indicated.
- 5 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers
- 6 of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by
- 7 ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a
- 8 qualified testing and inspecting agency.
- 9 a. Type: Post-installed expansion anchors.
- 10 b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn
- 11 5 (0.005 mm) for Class SC 1 service condition.
- 12 c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594,
- 13 Group 1 alloy 304 or 316 for bolts; alloy 304 or 316 for anchor.
- 14 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated
- 15 from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type
- 16 indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling
- 17 construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting
- 18 agency
- 19 F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
- 20 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
- 21 2. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
- 22 3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung")
- 23 will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- 24
- 25 G. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- 26 H. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet
- 27 complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter
- 28 bolts.
- 29 I. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 inches o.c. on all
- 30 cross tees.
- 31 J. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces
- 32 against acoustical tiles.
- 33 K. Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, pre-
- 34 painted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30
- 35 coating designation, with pre-finished 15/16-inch-wide metal caps on flanges.
- 36 1. Structural Classification: Intermediate-duty system.
- 37 2. Face Design: Flat, flush.
- 38 3. Cap Material: Steel or aluminum cold-rolled sheet.
- 39 4. Cap Finish: Painted white.
- 40

PART 3 - EXECUTION

3.1 EXAMINATION

- 44 A. Examine substrates, partitions, walls, and structural framing to which acoustical tile ceilings attach or abut, with
- 45 Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation
- 46 and anchorage of ceiling system, and with requirements for installation tolerances and other conditions affecting
- 47 performance of acoustical tile ceilings.
- 48 B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 49

3.2 PREPARATION

- 50 A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each
- 51 ceiling. Avoid using less-than-half-width tiles at borders and comply with layout shown on reflected ceiling plans.
- 52
- 53

3.3 INSTALLATION, GENERAL

- 54 A. General: Install acoustical tile ceilings to comply with ASTM C 636 UBC Standard 25-2, per manufacturer's written
- 55 instructions and CISCA's "Ceiling Systems Handbook."
- 56 B. Suspend ceiling hangers from building's structural members and as follows:
- 57

- 1 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are
- 2 not part of supporting structure or of ceiling suspension system.
- 3 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-
- 4 splaying, or other equally effective means.
- 5 3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions;
- 6 offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
- 7 4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere
- 8 with location of hangers at spacings required to support standard suspension system members, install
- 9 supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental
- 10 suspension members and hangers to support ceiling loads within performance limits established by
- 11 referenced standards and publications.
- 12 5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight
- 13 turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure
- 14 and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated
- 15 temperatures.
- 16 6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by
- 17 attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which
- 18 hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to
- 19 deteriorate or fail due to age, corrosion, or elevated temperatures.
- 20 7. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place
- 21 hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend
- 22 through forms into concrete.
- 23 8. Do not attach hangers to steel deck tabs.
- 24 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- 25 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless
- 26 otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- 27 C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend
- 28 bracing from building's structural members as required for hangers, without attaching to permanent metal forms,
- 29 steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or post-installed anchors.
- 30 D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal
- 31 edges of acoustical tiles.
- 32 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are
- 33 installed.
- 34 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from
- 35 ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately
- 36 and connect securely.
- 37 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- 38 E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace
- 39 dented, bent, or kinked members.
- 40 F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or
- 41 suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
- 42 G. Install acoustical tiles with undamaged edges and fit accurately into suspension system runners and edge moldings.
- 43 Scribe and cut tiles at borders and penetrations to provide a neat, precise fit.
- 44 1. For square-edged tiles, install tiles with edges fully hidden from view by flanges of suspension system runners
- 45 and moldings.
- 46 2. For reveal-edged tiles on suspension system runners, install tiles with bottom of reveal in firm contact with
- 47 top surface of runner flanges.
- 48 3. For reveal-edged tiles on suspension system members with box-shaped flanges, install tiles with reveal
- 49 surfaces in firm contact with suspension system surfaces and tile faces flush with bottom face of runners.
- 50 4. Paint cut edges of tile remaining exposed after installation; match color of exposed tile surfaces using coating
- 51 recommended in writing for this purpose by acoustical tile manufacturer.
- 52 5. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-
- 53 resistance ratings; space as recommended by tile manufacturer's written instructions, unless otherwise
- 54 indicated.
- 55 6. Install clean-room gasket system in areas indicated, sealing each tile and fixture as recommended by tile
- 56 manufacturer's written instructions.
- 57 7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated
- 58 assembly.

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3.4 CLEANING

- A. Replace damaged and broken tiles.
- B. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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**SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Resilient base.
 - 2. Resilient molding accessories.
- B. Related Sections include the following:
 - 1. Division 09 Section "Resilient Tile Flooring."
 - 2. Division 09 Section "Tile Carpeting."

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- C. Sustainable Design Submittals:
 - 1. Laboratory Test Reports: For floor covering products and adhesives, indicating compliance with requirements for low-emitting materials.
 - 2. Environmental Product Declarations: For rubber base.
 - 3. Product Data: For material ingredient disclosure.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.4 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Johnsonite.
 - 2. Flexco.
 - 3. Armstrong.
 - 4. Approved Equal.

2.2 RESILIENT BASE

- A. Product Standard: ASTM F1861.
 - 1. Material Requirement: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 2. Flexibility: Will not crack, break, or show any signs of fatigue when bent around a 1/4-inch diameter cylinder.
 - 3. Style: Cove base with toe.
 - 4. Meets or exceeds the performance requirements for resistance to heat/light aging, chemicals, and dimensional stability when tested to the methods described in ASTM F1861.
- B. Minimum Thickness: 0.125 inch.
- C. Height: 4 inches.
- D. Lengths: 4 feet straight of 120 feet coiled lengths.
- E. Outside Corners: Premade.
- F. Inside Corners: Premade.
- G. Locations: See Drawings.

1 H. Finish, Colors and Patterns: See Room Finish Schedule.

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3

2.3 RESILIENT ACCESSORIES

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A. Transition Strips:

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1. At dissimilar flooring materials.

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2. At direct glue carpet.

7

3. At other locations as indicated.

8

4. Color: Match the base.

9

10

2.4 RESILIENT MOLDING ACCESSORIES

11

A. Manufacturers: Subject to compliance with requirements, provide products that meet or exceed the performance requirements for resistance to heat/light aging, chemicals, and dimensional stability when tested to the methods as described in ASTM F1861 by one of the following manufacturers:

12

13

14

15

1. Johnsonite.

16

2. Flexco.

17

3. Armstrong.

18

4. Approved Equal.

19

B. Description: Carpet edge for glue-down applications, reducer strip for resilient floor covering, joiner for tile and

20

carpet, transition strips.

21

C. Material: Thermoset Rubber.

22

D. Profile and Dimensions: As indicated.

23

E. Colors and Patterns: See Room Finish Schedule.

24

25

2.5 INSTALLATION MATERIALS

26

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-

27

based formulation provided or approved by manufacturer for applications indicated.

28

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions

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indicated.

30

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Supart D (EPA

31

Method 24).

32

PART 3 - EXECUTION

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3.1 PREPARATION

36

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

37

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax,

38

oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

39

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps

40

and ridges to produce a uniform and smooth substrate.

41

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance

42

of installation.

43

1. Do not install resilient products until they are the same temperature as the space where they are to be

44

installed.

45

E. Areas to receive resilient products shall be clean, fully enclosed, weather tight, and maintained at a uniform

46

temperature of at least 65°F for 24 hours immediately before installation.

47

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After

48

cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after

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unsatisfactory conditions have been corrected.

50

G. Coiled resilient base shall be uncoiled and lay flat for at least 24 hours at 65°F prior to installation.

51

52

3.2 RESILIENT BASE INSTALLATION

53

A. Comply with manufacturer's written instructions for installing resilient base.

54

B. Installation work should not begin until the work of all other trades, especially overhead trades, has been completed.

55

C. Areas to receive resilient base shall be maintained at a uniform temperature of at least 65°F for 24 hours during and

56

for 24 hours after the installation is completed.

57

D. The resilient base and adhesives shall be conditioned in the same manner.

- 1 E. Floors and walls shall be clean, dry, free of dust, all paints, wallpaper, and all other foreign materials which may affect
- 2 proper adhesive bonding.
- 3 F. Resilient bases shall not be installed on surfaces that will be exposed to drastic temperature changes or moisture.
- 4 G. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures
- 5 in rooms and areas where base is required.
- 6 H. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- 7 I. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with
- 8 horizontal and vertical substrates.
- 9 J. Do not stretch resilient base during installation.

10

11 **3.3 RESILIENT ACCESSORY INSTALLATION**

- 12 A. Comply with manufacturer's written instructions for installing resilient accessories.
- 13 B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each
- 14 piece. Install reducer strips at edges of carpet and floor coverings that would otherwise be exposed.

15

16 **3.4 CLEANING AND PROTECTION**

- 17 A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- 18 B. Perform the following operations immediately after completing resilient product installation:
 - 19 1. Remove adhesive and other blemishes from exposed surfaces.
 - 20 2. Sweep and vacuum surfaces thoroughly.
 - 21 3. Damp-mop surfaces to remove marks and soil.
 - 22 a. Do not wash surfaces until after time period recommended by manufacturer.
- 23 C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and
- 24 placement of equipment and fixtures during remainder of construction period. Use protection methods
- 25 recommended in writing by manufacturer. Cover resilient products until Substantial Completion.

26

27

END OF SECTION

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**SECTION 09 68 13
TILE CARPETING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Tile Carpeting.
 - 2. Walk-Off Carpet.
- B. Related Sections include the following:
 - 1. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:
 - 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
 - 2. Carpet type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
- D. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile and carpet cushion.
- E. Sustainable Design Submittals:
 - 1. Environmental Product Declarations: For each product.
 - 2. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 3. Material Ingredient Reporting: For each product.
- F. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer, certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
- C. General Terminology and Information Standard: "Carpet Specifier's Handbook" by The Carpet and Rug Institute (CRI).

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.5 PROJECT CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tile over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.6 PRE-INSTALLATION MEETINGS

- 1 A. Pre-installation Conference: Review methods and procedures related to carpet installation, including:
- 2
- 3 1. Delivery, storage, and handling procedures.
- 4 2. Ambient conditions and ventilation procedures.
- 5 3. Subfloor preparation procedures, including relative humidity, moisture and alkalinity tests.
- 6

7 **1.7 WARRANTY**

- 8 A. Special Warranty for Carpet Tile: Manufacturer's standard form in which manufacturer agrees to repair or replace
- 9 components of carpet tile installation that fails in materials or workmanship within specified warranty period.
- 10 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate,
- 11 vandalism, or abuse.
- 12 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs,
- 13 loss of tuft bind strength, excess static discharge, and delamination.
- 14 3. Warranty Period: 10 years from date of Substantial Completion.
- 15 B. Special Installation Warranty: Installer's written warranty, co-signed by Contractor, agreeing to provide labor and
- 16 materials to replace carpet tile and accessories that fail due to installation defects, including inadequate subflooring
- 17 preparation and adhesion failures.
- 18 1. Warranty does not include failure due to vandalism or abuse.
- 19 2. Warranty Period: Five (5) years from date of Substantial Completion.
- 20

21 **1.8 EXTRA MATERIALS**

- 22 A. All usable pieces of carpet tile remaining after completion of the work shall be left with the Owner at the Project Site.
- 23 B. Provide 3% attic stock.
- 24

25 **PART 2 - PRODUCTS**

26

27 **2.1 CARPET**

- 28 A. Manufacturers: Subject to compliance with requirements, provide carpet tile by one of the following manufacturers:
- 29 1. Shaw.
- 30 2. Mohawk.
- 31 3. Interface.
- 32 4. Approved equal.
- 33 B. Products: See Finish List on Drawings.
- 34 C. Antimicrobial Treatment: Manufacturer's standard.
- 35

36 **2.2 ACCESSORIES**

- 37 A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or
- 38 recommended by carpet cushion manufacturer.
- 39 B. Special Coatings: As recommended by floor adhesive manufacturers to suit indicated resilient products and substrate
- 40 conditions.
- 41 C. Adhesives: Water-resistant, mildew-resistant, non-staining type to suit products and subfloor conditions indicated,
- 42 that complies with flammability requirements for installed carpet and is recommended or provided by carpet
- 43 manufacturer.
- 44 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA
- 45 Method 24).
- 46 D. Vinyl Transition Strips: Vinyl transition strip of width shown, of height required to protect exposed edge of carpet,
- 47 and of maximum lengths to minimize running joints.
- 48

49 **PART 3 - EXECUTION**

50

51 **3.1 EXAMINATION**

- 52 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum
- 53 moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.
- 54 Examine carpet for type, color, pattern, and potential defects.
- 55 B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
- 56 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may
- 57 interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and
- 58 moisture tests recommended by carpet and cushion manufacturer.

- 1 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs
- 2 receiving carpet.
- 3 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- 4 C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 5

6 **3.2 PREPARATION**

- 7 A. General: Comply with CRI 104, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written
- 8 installation instructions for preparing substrates indicated to receive carpet tiles.
- 9 B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks,
- 10 holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider,
- 11 and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written
- 12 instructions.
- 13 C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that
- 14 contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by
- 15 carpet tile and cushion manufacturer.
- 16 D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.
- 17

18 **3.3 INSTALLATION**

- 19 A. Comply with CRI 104, Section 104 and with carpet tile manufacturers' written installation instructions and the
- 20 following:
 - 21 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
- 22 B. Comply with carpet tile manufacturer's written recommendations for seam locations and direction of carpet tile;
- 23 maintain uniformity of carpet tile direction and lay of pile. At doorways, center seams under the door in closed
- 24 position.
- 25 C. Do not bridge building expansion joints with carpet tile.
- 26 D. Maintain dye lot integrity. Do not mix dye lots in same area.
- 27 E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets,
- 28 pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- 29 F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves,
- 30 and similar openings.
- 31 G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish
- 32 flooring as marked on subfloor. Use nonpermanent, non-staining marking device.
- 33 H. Install pattern parallel to walls and borders.
- 34

35 **3.4 CLEANING AND PROTECTING**

- 36 A. Perform the following operations immediately after installing carpet:
 - 37 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet
 - 38 tile manufacturer.
 - 39 2. Remove yarns that protrude from carpet tile surface.
 - 40 3. Vacuum carpet tile using commercial machine with face-beater element.
- 41 B. Protect installed carpet tile to comply with CRI 104, "Protecting Indoor Installations."
- 42 C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the
- 43 remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile
- 44 manufacturer and carpet tile adhesive manufacturer.
- 45
- 46

47 END OF SECTION 09 68 13

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**SECTION 09 72 00
WALL COVERINGS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Vinyl impact-resistant wall covering.
- B. Related Sections:
 - 1. Section 09 2900 "Gypsum Board" for level of wall finish.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- B. Samples for Verification: Full width by 36-inch-long section of wall covering.
 - 1. Sample from same print run or dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
- C. Maintenance Data: For wall coverings to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete, and dry work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall covering manufacturer for full drying or curing.

1.5 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. Wall Covering Materials: For each type, full-size units equal to three (3) percent of amount installed.

PART 2 - PRODUCTS

2.1 WALL COVERINGS

- A. General: Provide rolls of each type of wall covering from same print run or dye lot.

2.2 VINYL WALL COVERING

- A. Manufacturers:
 - 1. MDC.
 - 2. Momentum.
 - 3. Wolf Gordon.
 - 4. Approved equal.
- B. Description: Provide vinyl products in rolls from the same production run and complying with the following:
 - 1. FS CCC-W-408D and Wallcovering Association's W-101 for Type III, Heavy Duty.
 - 2. Colors, Textures, and Patterns: See Drawings.

1 **2.3 ACCESSORIES**

- 2 A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate
3 application; as recommended in writing by wall-covering manufacturer.
4 B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "Interior Painting" and
5 recommended in writing by wall-covering manufacturer for intended substrate.
6

7 **PART 3 - EXECUTION**

8
9 **3.1 EXAMINATION**

- 10 A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall
11 plumbness, maximum moisture content, and other conditions affecting performance of the Work.
12 B. Proceed with installation only after unsatisfactory conditions have been corrected.
13

14 **3.2 PREPARATION**

- 15 A. Comply with manufacturer's written instructions for surface preparation.
16 B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and
17 incompatible primers.
18 C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings,
19 cracks, and defects.
20 1. Moisture Content: Maximum of 5 percent on new plaster, concrete and concrete masonry units when tested
21 with an electronic moisture meter.
22 2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-
23 covering manufacturer.
24 3. Painted Surfaces: Treat areas susceptible to pigment bleeding.
25 D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
26 E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
27 F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours
28 before installation.
29

30 **3.3 INSTALLATION**

- 31 A. General: Comply with wall-covering manufacturer's written installation instructions applicable to products and
32 applications indicated except where more stringent requirements apply.
33 B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.
34 C. Install strips in same order as cut from roll.
35 D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
36 E. Match pattern 72 inches above the finish floor.
37 F. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a
38 change of pattern or color exists at corner. No horizontal seams are permitted.
39 G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
40 H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or
41 spacing between strips.
42

43 **3.4 CLEANING**

- 44 A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
45 B. Use cleaning methods recommended in writing by wall-covering manufacturer.
46 C. Replace strips that cannot be cleaned.
47 D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
48

49 **END OF SECTION**

1
2

SECTION 09 74 00
WOOD VENEER

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. This Section includes the following:
6 1. Wood veneer panels.
7 2. Adhesive.

8 **1.2 SUBMITTALS**

- 9 A. Samples: For each wood species specified. Include product name, wood species, and cut labelled on the back of
10 sample.

11 **1.3 DELIVERY, STORAGE, AND HANDLING**

- 12 A. All Real Wood Veneers Flexible Wood Wallcovering must be delivered to the job site in the Manufacturer's packaging,
13 property identified and labeled.
14 B. Material must be stored in an undamaged condition in Manufacturer's packaging, maintained in a clean, dry,
15 protected area where temperature and humidity remain stable and within the ranges specified by the Manufacturer.

16 **1.4 QUALITY ASSURANCE**

- 17 A. Installer to have minimum 3-years experience installing architectural wood wallcovering on projects of similar size and
18 complexity.

19 **1.5 PROJECT CONDITIONS**

- 20 A. Environmental Conditions: Areas to receive Real Wood Veneers Flexible Wood Wallcovering to be environmentally
21 controlled by the HVAC system. Maintain a temperature range of 65° - 85° Fahrenheit, with less than 50% relative
22 humidity, for a period of not less than four (4) days prior to installation and maintained thereafter.
23 B. Lighting: Sufficient lighting will be provided by the Contractor during the Installation process. If required, temporary
24 lighting will be provided to augment insufficient or low-level permanent lighting.
25 C. Wall Conditions: Gypsum board finish shall be completed to comply with AWCI Specification, Level 5. Plaster walls
26 shall be finished to the Architect's specification and be free of undulations and defects.

27 **PART 2 - PRODUCTS**

28 **2.1 PERFORMANCE REQUIREMENTS**

- 29 A. Fire Rating Characteristics: Class A fire rated in accordance with ASTM E84.
30 1. Flame Spread: 10.
31 2. Smoke Development: 25.

32 **2.2 WOOD VENEER**

- 33 A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
34 1. Oakwood Veneer Company.
35 2. American Architectural Millwork, LLC.
36 3. Woodcraft Supply, LLC.
37 4. Or approved equal.
38 B. Species: Pine.
39 C. Cut: Flat cut.

40 **2.3 ACCESSORIES**

- 41 A. Adhesive:
42 1. Roman Decorating Products:
43 a. Pro-732 Extra Strength Clay Based Adhesive.
44 b. Pro-774 Clay Strippable.
45 B. Primer
46 1. Roman Decorating Products:

**SECTION 09 84 33
SOUND-ABSORBING WALL UNITS**

3 PART 1 - GENERAL

4 1.1 SUMMARY

- 5 A.** Section includes shop-fabricated, acoustical panel units tested for acoustical performance, including the following:
- 6 1.** Sound-absorbing wall panels.

7 1.2 DEFINITIONS

- 8 A.** NRC: Noise Reduction Coefficient.

9 1.3 ACTION SUBMITTALS

- 10 A.** Product Data: For each type of product.
 - 11 1.** Include fabric facing, panel edge, core material, and mounting indicated.
- 12 B.** Sustainable Design Submittals:
 - 13 1.** Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
 - 14 2.** Laboratory Test Reports: For wall materials, indicating compliance with requirements for low-emitting materials.
- 16 C.** Shop Drawings: For unit assembly and installation.
 - 17 1.** Include plans, elevations, sections, and mounting devices and details.
 - 18 2.** Include details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge profile and core materials.
 - 19 3.** Include details at cutouts and penetrations for other work.
 - 20 4.** Include direction of fabric weave and pattern matching.
- 21 D.** Samples for Initial Selection: For each type of fabric facing.
- 22**

23 1.4 CLOSEOUT SUBMITTALS

- 24 A.** Maintenance Data: For each type of unit to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal instructions.
- 25**

26 1.5 DELIVERY, STORAGE, AND HANDLING

- 27 A.** Comply with fabric and unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- 28 B.** Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
- 29**
- 30**

31 1.6 FIELD CONDITIONS

- 32 A.** Environmental Limitations: Do not install units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- 33 B.** Lighting: Do not install units until a lighting level of not less than 50 fc is provided on surfaces to receive the units.
- 34 C.** Field Measurements: Verify unit locations and actual dimensions of openings and penetrations by field measurements before fabrication, and indicate them on Shop Drawings.
- 35**
- 36**
- 37**

38 1.7 WARRANTY

- 39 A.** Special Warranty: Manufacturer agrees to repair or replace units and components that fail in materials or workmanship within specified warranty period.
 - 40 1.** Failures include, but are not limited to the following:
 - 41 a.** Acoustical performance.
 - 42**

- 1 b. Fabric sagging, distorting, or releasing from panel edge.
- 2 c. Warping of core.
- 3 2. Warranty Period: 1 year from date of Substantial Completion.

4 **PART 2 - PRODUCTS**

5 **2.1 PERFORMANCE REQUIREMENTS**

- 6 A. Fire-Test-Response Characteristics: Units shall comply with "Surface-Burning Characteristics" or "Fire Growth Contribution" Subparagraph below, or both, as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 7 1. Surface-Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 8 a. Flame-Spread Index: 25 or less.
 - 9 b. Smoke-Developed Index: 450 or less.
 - 10 2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265 Method B Protocol or NFPA 286.

15 **2.2 SOUND-ABSORBING WALL UNITS**

- 16 A. Sound-Absorbing Wall Panel: Manufacturer's standard panel construction consisting of facing material stretched over front face of edge-framed core and bonded or attached to edges and back of frame.
 - 17 1. Basis-of-Design Product: Subject to compliance with requirements, provide HealthGuard UI Panels by Kinetics Noise Control, Inc., or comparable product by one of the following:
 - 18 a. Conwed
 - 19 b. Essi Acoustical Products
 - 20 c. Or approved equal.
 - 21 2. Mounting:
 - 22 a. Back mounted with manufacturer's standard metal clips or bar hangers, secured to substrate.
 - 23 b. Essi Acoustical Products
 - 24 c. Or approved equal.
 - 25 3. Core: Manufacturer's standard.
 - 26 4. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
 - 27 5. Edge Profile: Square.
 - 28 6. Facing Material: As indicated on Drawings.
 - 29 7. Acoustical Performance: Sound absorption NRC of 1.00 according to ASTM C423 for mounting according to ASTM E795.
 - 30 8. Nominal Overall Panel Thickness: 2-1/8-inch.
 - 31 9. Panel Width: As indicated on Drawings.
 - 32 10. Panel Height: As indicated on Drawings.

34 **2.3 MATERIALS**

- 35 A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 55 percent.
- 36 B. Core Materials: Manufacturer's standard.
- 37 C. Facing Material: Fabric from same dye lot; color and pattern with bleach cleanable finish.
- 38 D. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:
 - 39 1. Metal Clips or Bar Hangers: Manufacturer's standard two-part metal "Z" clips, with one part of each clip mechanically attached to back of unit and the other part to substrate, designed to permit unit removal.

43 **2.4 FABRICATION**

- 44 A. Standard Construction: Use manufacturer's standard construction unless otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
- 45 B. Edge Hardening: For glass-fiber board cores, chemically harden core edges and areas of core where mounting devices are attached.

- 1 C. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the
- 2 grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible
- 3 distortions or foreign matter.
- 4 1. Square Corners: Tailor corners.
- 5 2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in
- 6 same direction so pattern or weave matches in adjacent units.
- 7 D. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
- 8 1. Thickness.
- 9 2. Edge straightness.
- 10 3. Overall length and width.
- 11 4. Squareness from corner to corner.
- 12 5. Chords, radii, and diameters.

13 **PART 3 - EXECUTION**

14 **3.1 EXAMINATION**

- 15 A. Examine fabric, fabricated units, substrates, areas, and conditions for compliance with requirements, installation
- 16 tolerances, and other conditions affecting unit performance.
- 17 B. Proceed with installation only after unsatisfactory conditions have been corrected.

18 **3.2 INSTALLATION**

- 19 A. Install units in locations indicated. Unless otherwise indicated, install units with vertical surfaces and edges plumb,
- 20 top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders
- 21 and at penetrations.
- 22 B. Comply with manufacturer's written instructions for installation of units using type of mounting devices indicated.
- 23 Mount units securely to supporting substrate.
- 24 C. Align fabric pattern and grain as indicated on Drawings.

25 **3.3 INSTALLATION TOLERANCES**

- 26 A. Variation from Plumb and Level: Plus or minus 1/16 inch in 48 inches, noncumulative.
- 27 B. Variation of Joint Width: Not more than 1/16-inch variation from hairline in 48 inches, noncumulative.

28 **3.4 CLEANING**

- 29 A. Clip loose threads; remove pills and extraneous materials.
- 30 B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's
- 31 written instructions.

32 **END OF SECTION**

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**SECTION 09 91 23
INTERIOR PAINTING**

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior and interior substrates:
 - 1. Gypsum board.
 - 2. Steel.
 - 3. Galvanized, primed, and bare metal.
 - 4. CMU block.
 - 5. And as indicated.
- B. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers, and fillers and other applied material whether used as prime, intermediate, or finish coats.
- C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

1.2 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
- C. Product List: Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
- D. Sustainable Design Submittals:
 - 1. VOC Content Submittal: For all interior paints, product data including printed statement of VOC content.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with the listed basis of design product or MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
- C. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

- 1 D. Coatings Maintenance Manual: Upon conclusion of the project, the contractor or paint manufacturer/supplier shall
2 furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information"
3 report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each
4 product/color/finish was used, product data pages, Safety Data Sheets, care and cleaning instructions, touch-up
5 procedures, and color samples of each color and finish used.

6 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 7 A. Do not deliver materials to site until having received all written approvals of submitted information and samples.
8 B. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's
9 name and label and the following information:
10 1. Product name or title of material.
11 2. Product description (generic classification or binder type).
12 3. Manufacturer's stock number and date of manufacture.
13 4. Contents by volume, for pigment and vehicle constituents.
14 5. Thinning instructions.
15 6. Application instructions.
16 7. Color name and number.
17 8. VOC content.
18 C. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of
19 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
20 1. Keep storage area neat and orderly. Remove oily rags and waste daily.
21 D. Take all precautions to insure that workers and work areas are adequately protected from fire hazards and health
22 hazards resulting from handling, mixing and applications of paint.

23 **1.6 PROJECT CONDITIONS**

- 24 A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and
25 90 deg F.
26 B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and
27 95 deg F.
28 C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less
29 than 5 deg F above the dew point; or to damp or wet surfaces.
30 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated
31 within temperature limits specified by manufacturer during application and drying periods.
32 D. Do not apply paint to surfaces in hot sunlight.

33 **1.7 SEQUENCING AND SCHEDULING**

- 34 A. Schedule cleaning and painting so that contaminants from cleaning process will not fall onto newly-painted
35 surfaces.

36
37 **1.8 EXTRA MATERIALS**

- 38 A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that
39 are packaged for storage and identified with labels describing contents.
40 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.
41
42

43 **PART 2 – PRODUCTS**

44
45
46 **2.1 MANUFACTURERS**

- 47 A. Subject to compliance with requirements, provide products by one of the following:
48 1. Benjamin Moore & Co.
49 2. Sherwin-Williams Company.
50 3. PPG Industries.
51 4. Approved equal.
52
53

1 **2.2 PAINT, GENERAL**

- 2 A. Material Compatibility:
- 3 1. Provide materials for use within each paint system that are compatible with one another and substrates
- 4 indicated, under conditions of service and application as demonstrated by manufacturer, based on testing
- 5 and field experience.
- 6 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for
- 7 use in paint system and on substrate indicated.
- 8 B. VOC Content: For field applications that are inside the weatherproofing system, use paints and coatings that
- 9 comply with South Coast Rule #1113 and Green Seal Standards GS-11 and GS-03 for VOC content when
- 10 calculated according to 40 CRF 59, Subpart D.
- 11 1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
- 12 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L
- 13 3. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
- 14 4. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
- 15 C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-
- 16 corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions;
- 17 these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
- 18 1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total
- 19 aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
- 20 a. Restricted Components: Paints and coatings shall not contain any of the following:
- 21 1) Acrolein.
- 22 2) Acrylonitrile.
- 23 3) Antimony.
- 24 4) Benzene.
- 25 5) Butyl benzyl phthalate.
- 26 6) Cadmium.
- 27 7) Di (2-ethylhexyl) phthalate.
- 28 8) Di-n-butyl phthalate.
- 29 9) Di-n-octyl phthalate.
- 30 10) 1,2-dichlorobenzene.
- 31 11) Diethyl phthalate.
- 32 12) Dimethyl phthalate.
- 33 13) Ethylbenzene.
- 34 14) Formaldehyde.
- 35 15) Hexavalent chromium.
- 36 16) Isophorone.
- 37 17) Lead.
- 38 18) Mercury.
- 39 19) Methyl ethyl ketone.
- 40 20) Methyl isobutyl ketone.
- 41 21) Methylene chloride.
- 42 22) Naphthalene.
- 43 23) Toluene (methylbenzene).
- 44 24) 1,1,1-trichloroethane.
- 45 25) Vinyl chloride.
- 46 D. Colors: As indicated on Room Finish Schedule.

47

48

49 **2.3 INTERIOR PAINT AND COATINGS**

- 50
- 51 A. Metal; Galvanized: Joists, Decking, Beams, and Duct work.
- 52 1. Dryfall Waterborne Topcoats:
- 53 a. Eg-Shel Finish:
- 54 1) 2 Coats: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-182 Series: MPI #155
- 55 b. Flat Finish:
- 56 1) 2 Coats: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-181 Series: MPI #118
- 57 B. Masonry CMU:
- 58 1. Latex Systems:

- 1 a. Semi-Gloss Finish:
- 2 1) 1st Coat: S-W PrepRite Block Filler, B25W25.
- 3 2) 2nd and 3rd Coat: S-W Pro Industrial Acrylic Semi-Gloss, B66-650 series.
- 4 C. Drywall: Walls, Ceilings, Gypsum Board and similar items.
- 5 1. Latex Systems:
- 6 a. Eg-Shel / Satin Finish: High Performance (HP) Upgrade.
- 7 1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600: MPI #50
- 8 2) 2nd Coat: S-W ProMar 200 HP Zero VOC Latex Eg-Shel, B20-1950 Series: MPI #143
- 9 3) 3rd Coat: S-W ProMar 200 HP Zero VOC Latex Eg-Shel, B20-1950 Series: MPI #143

11 2.4 EQUIPMENT

- 13 A. Provide all brushes, rollers, ladders, scaffolding and other equipment of any kind to properly execute each type of
- 14 work.

16 PART 3 – EXECUTION

19 3.1 EXAMINATION

- 21 A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum
- 22 moisture content and other conditions affecting performance of work.
- 23 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces
- 24 receiving paint are thoroughly dry.
- 25 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular
- 26 area.
- 27 B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
- 28 1. Gypsum Board: 12 percent.
- 29 C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- 30 D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
- 31 E. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total
- 32 system for various substrates. On request, furnish information on characteristics of finish materials to ensure use
- 33 of compatible primers.
- 34 1. Notify Architect about anticipated problems when using the materials specified over substrates primes by
- 35 others.

37 3.2 PREPARATION

- 39 A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar
- 40 items already installed that are not to be painted. If removal is impractical or impossible because of size or
- 41 weight of the item, provide surface-applied protection before surface preparation and painting.
- 42 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in
- 43 the trades involved.
- 44 B. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting
- 45 Specification
- 46 Manual" applicable to substrates indicated.
- 47 C. Cleaning: Before applying paint or other surface treatment, clean substrates of substances that could impair
- 48 bond of the various coatings. Remove oil, grease and incompatible paints before cleaning.
- 49 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on
- 50 wet, newly painted surfaces.
- 51 D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions
- 52 for each particular substrate condition.
- 53 E. Gypsum Board: Fill minor irregularities with patching material and sand to smooth level surfaces taking care not
- 54 to raise nap of paper.
- 55 1. All exposed gypsum board is to be primed and painted.
- 56 F. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
- 57 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and
- 58 residue.

- 1 2. Stir material before application to produce a mixture of uniform density. Stir as required during application.
- 2 Do not stir surface film into materials. If necessary, remove surface film and strain material before using.
- 3 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- 4 G. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same
- 5 material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in
- 6 shade of undercoats to distinguish each separate coat.
- 7
- 8

9 **3.3 APPLICATION**

- 11 A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for
- 12 substrate and type of material being applied.
- 13 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
- 14 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of
- 15 a durable paint film.
- 16 3. Provide finish coats that are compatible with primers used.
- 17 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector
- 18 covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas,
- 19 as required, to maintain system integrity and provide desired protection.
- 20 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final
- 21 installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat
- 22 only.
- 23 6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
- 24 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- 25 B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity and to
- 26 prevent hazardous accumulations of dust, fumes, vapors or gases.
- 27 C. Do work under adequate illumination and dust-free conditions.
- 28 1. Apply paint by brush, roller or spray methods except where particular method will produce unsatisfactory
- 29 results. Where spray method is used on concrete block, follow with roller to work paint into voids.
- 30 D. Materials.
- 31 1. Do not open containers until required for use.
- 32 2. Stir materials thoroughly and keep at uniform consistency during application.
- 33 E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting
- 34 as soon as practicable after preparation and before subsequent surface deterioration.
- 35 1. The number of coats and film thickness required are the same regardless of application method. Do not apply
- 36 succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to
- 37 produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
- 38 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
- 39 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film
- 40 is of uniform finish, color, and appearance.
- 41 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has
- 42 dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until
- 43 application of another coat of paint does not cause undercoat to lift or lose adhesion.
- 44 F. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to
- 45 manufacturer's written instructions.
- 46 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item
- 47 being painted.
- 48 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for
- 49 material and texture required.
- 50 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material
- 51 and texture required.
- 52 G. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to
- 53 achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by
- 54 manufacturer.
- 55 H. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment
- 56 rooms and occupied spaces.
- 57 I. Mechanical Items to be painted include, but are not limited to, the following:
- 58 1. Uninsulated metal piping.

- 1 2. Uninsulated plastic piping.
- 2 3. Pipe hangers and supports.
- 3 4. Tanks that do not have factory-applied final finishes.
- 4 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
- 5 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
- 6 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- 7 J. Electrical items to be painted include, but are not limited to, the following:
 - 8 1. Switchgear.
 - 9 2. Panel boards.
 - 10 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- 11 K. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is
12 required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces
13 where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or
14 other defects due to insufficient sealing.
- 15 L. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish
16 free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
17 Provide satin finish for all final coats.
- 18 M. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs,
19 sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- 20 N. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not
21 complying with requirements.
- 22 O. At completion of construction activities of other trades, touch up and restore damaged or defaced painted
23 surfaces.

24 **3.4 CLEANING**

- 25 A. During the progress of this work, remove from the site all discarded paint materials, rubbish, cans and rags at the
26 end of each work day.
- 27 B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint
28 by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

29 **3.5 PROTECTION**

- 30 A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage
31 by cleaning, repairing or replacing, refinishing, and repainting, as approved by Architect, and leave in undamaged
32 condition.
- 33 B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary
34 protective wrappings provided by others to protect their work.
 - 35 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply
36 with procedures specified in PDCA P1.

37 **3.6 INTERIOR PAINT SCHEDULE**

- 38 A. In addition to obvious surfaces, the following do not require painting or finishing.
 - 39 1. Do not include painting when factory-finishing or installer-finishing is specified for such items as (but not
40 limited to) metal toilet enclosures, acoustic material, finished mechanical and electrical equipment
41 including light fixtures, switchgear and distribution cabinets.
 - 42 2. Painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible
43 areas, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.
 - 44 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished
45 materials will not require finish painting, unless otherwise indicated.
 - 46 4. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators,
47 linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise
48 indicated.
 - 49 5. Do not paint over any code-required labels, such as Underwriter's Laboratories and factory Mutual, or any
50 equipment identification, performance rating, name or nomenclature plate.

- 1 B. Walls and Ceilings
2 1. Paint all rooms listed on Finish Plan. In unscheduled areas, use paint type to match existing. Paint patched
3 walls from 90 degree corner and patched ceilings complete.
4 2. Do not apply next coat until previous is thoroughly dry.
5 3. Provide final coat which is solid and even in color, free from runs, laps, sags, brush marks, air bubbles and
6 excessive roller stipple and worked into crevices, joints, and similar areas.
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END OF SECTION

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**SECTION 09 96 00
HIGH-PERFORMANCE COATINGS**

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Galvanized metal.

1.2 ACTION 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 indicated.

1.3 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.

1.4 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

- 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. Benjamin Moore & Co.
 - 2. PPG Paints; PPG Industries, Inc.
 - 3. Tnemec Company, Inc.
- B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.
- C. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- D. Material Compatibility:
 - 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Products shall be of same manufacturer for each coat in a coating system.

- 1 E. Colors: As selected by Architect from manufacturer's full range.
- 2 **2.2 SOURCE QUALITY CONTROL**
- 3 A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 - 4 1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor
 - 5 will be notified in advance and may be present when samples are taken. If coating materials have
 - 6 already been delivered to Project site, samples may be taken at Project site. Samples will be
 - 7 identified, sealed, and certified by testing agency.
 - 8 2. Testing agency will perform tests for compliance with product requirements.
 - 9 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do
 - 10 not comply with product requirements. Contractor shall remove noncomplying coating materials
 - 11 from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will
 - 12 be required to remove rejected materials from previously coated surfaces if, on recoating with
 - 13 complying materials, the two coatings are incompatible.
 - 14

15 **PART 3 - EXECUTION**

16

17 **3.1 EXAMINATION**

- 18 A. Examine substrates and conditions, with Applicator present, for compliance with requirements for
- 19 maximum moisture content and other conditions affecting performance of the Work.
- 20 B. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 21 1. Application of coating indicates acceptance of surfaces and conditions.
 - 22

23 **3.2 PREPARATION**

- 24 A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting
- 25 Specification Manual" applicable to substrates and coating systems indicated.
- 26 B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and
- 27 incompatible paints and encapsulants.
 - 28 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as
 - 29 required to produce coating systems indicated.
- 30 C. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended
- 31 in writing by paint manufacturer.
 - 32 1. SSPC-SP 7/NACE No. 4.
 - 33 2. SSPC-SP 11.
 - 34 3. SSPC-SP 6/NACE No. 3.
 - 35 4. SSPC-SP 10/NACE No. 2.
 - 36 5. SSPC-SP 5/NACE No. 1.
- 37 D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical
- 38 methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.
- 39

40 **3.3 APPLICATION**

- 41 A. Apply high-performance coatings according to manufacturer's written instructions and recommendations
- 42 in "MPI Architectural Painting Specification Manual."
- 43 B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a
- 44 uniform coating finish, color, and appearance.
- 45 C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs,
- 46 sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- 47

48 **3.4 FIELD QUALITY CONTROL**

- 49 A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to

- 1 inspect and test coatings for dry film thickness.
- 2 1. Contractor shall touch up and restore coated surfaces damaged by testing.
- 3 2. If test results show that dry film thickness of applied coating does not comply with coating
- 4 manufacturer's written recommendations, Contractor shall pay for testing and apply additional
- 5 coats as needed to provide dry film thickness that complies with coating manufacturer's written
- 6 recommendations.
- 7

8 **3.5 CLEANING AND PROTECTION**

- 9 A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- 10 B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing,
- 11 scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- 12 C. Protect work of other trades against damage from coating operation. Correct damage to work of other
- 13 trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an
- 14 undamaged condition.
- 15 D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated
- 16 surfaces.
- 17

18 **3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE**

- 19 A. Steel Substrates:
- 20 1. Primer: Tnemec Series 90-97 Tnemec-Zinc Aromatic Urethane Zinc Rich Primer.
- 21 2. Intermediate Coat: Tnemec Series 73 Endura Shield Aliphatic Acrylic Polyurethane.
- 22 a. Thickness: 4-5 mils.
- 23 3. Finish Coat: Tnemec Series 1072.
- 24 a. Thickness: 2-3 mils.
- 25 4. Color: See Building Elevations in the Drawings.
- 26
- 27

28 **END OF SECTION**

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**SECTION 10 14 00
SIGNAGE**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Barrier Free Identification.
 - 2. Room Signage.
 - 3. Informational Signage.
 - 4. Parking Lot Accessible Stall Signage.

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

- A. Section 01 3300 – Submittal Procedures: Submittal procedures.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
- D. Samples: For each sign type and for each color and texture required.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with applicable provisions of the ADA-ABA Accessibility Guidelines; the International Building Code, Chapter 11 "Accessibility"; and the Wisconsin Administrative Code Chapter SPS 362.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Inpro Corporation.
- B. Mohawk Sign Systems.
- C. Schwaab, Inc.
- D. Approved equal.

2.2 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M0, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.
- C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.
- D. Acrylic Sheet: ASTM D4802, category standard with manufacturer for each sign, Type UVF (UV filtering).
- E. Plastic Laminate: High-pressure laminate engraving stock with face and core in contrasting colors.
- F. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.3 INTERIOR SIGNS

- A. All signs to be ADA-ABA compliant.
- B. Room Identifying Signs
 - 1. Type and Quantity: Provide room sign at each room location. At offices provide room name and paper slide-in for names of employees. Paper slide-in by others.
- C. Informational Signs
 - 1. Provide directional signage at each entrance.
- D. Barrier Free Identification:
 - 1. 10" x 10" plastic laminated sign bearing the international barrier free symbol at each accessible entrance.

- 1 2. 8" x 8" plastic laminated sign bearing the international barrier free symbol at restroom doors.
- 2 3. Tactile and Braille Signage: Manufacturer's standard process for producing text and symbols complying with
- 3 ADA-ABA Accessibility Guidelines and ICC/ANSI A 117.1. Text shall be accompanied by Grade 2 Braille.
- 4 Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with
- 5 domed or rounded shape. Raised-copy thickness shall be not less than 1/32 inch.
- 6

7 **2.4 EXTERIOR SIGNS**

- 8 A. Exterior Signs for Parking Spaces: Provide enameled steel signs and support posts as detailed on the Project Drawings
- 9 and per Wisconsin Department of Transportation standards.

10

11 **2.5 ACCESSORIES**

- 12 A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations
- 13 and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-
- 14 place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- 15

16 **PART 3 - EXECUTION**

17

18 **3.1 INSTALLATION**

- 19 A. Locate signs where indicated or directed by Architect. Comply with manufacturer's written instructions.
- 20 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects
- 21 in appearance.
- 22 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated
- 23 or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3
- 24 inches of sign without encountering protruding objects or standing within swing of door:
- 25 B. Install room identification signs at 5 feet from centerline of signs to finished floor.
- 26 1. When used in conjunction with accessibility symbol, mount below symbol.
- 27 C. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent
- 28 requirements apply.
- 29 1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs
- 30 with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign
- 31 manufacturer.
- 32 2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting
- 33 materials.
- 34 3. Projected Mounting: Mount characters at projection distance from wall surface indicated.
- 35 D. Parking Lot Accessible Stall Signage:
- 36 1. Install accessible parking signs; locations and heights to meet regulatory requirements under Quality
- 37 Assurance and Wisconsin Department of Transportation standards.
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END OF SECTION

SECTION 10 14 19
DIMENSIONAL LETTER SIGNAGE

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Dimensional characters.
 - a. Cast dimensional characters.
 - b. Illuminated, fabricated channel dimensional characters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
 - 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. A.R.K. Ramos
 - b. ASI Sign Systems, Inc
 - c. Gemini Signage; Gemini, Inc.
 - d. Or approved equal.
 - 2. Character Material: Cast aluminum.
 - 3. Character Height: As indicated on Drawings.
 - 4. Finishes:
 - a. Integral Aluminum Finish: Anodized color as selected by Architect from full range of industry colors and color densities.
 - 5. Mounting: Concealed studs.

2.2 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

1 C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of
2 use and finish indicated.

3 **2.3 ACCESSORIES**

- 4 A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and
5 compatible with each material joined, and complying with the following:
6 1. Use concealed fasteners and anchors unless indicated to be exposed.
7 2. For exterior exposure, furnish stainless steel devices unless otherwise indicated.
8 B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

9 **2.4 FABRICATION**

- 10 A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
11 1. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that
12 impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate
13 marks, casting flash, and other casting marks before finishing.
14 B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and
15 mounting conditions indicated. Modify manufacturer's standard brackets as required.
16 1. Stainless Steel Brackets: Factory finish brackets to match sign background finish unless otherwise indicated.

17 **2.5 GENERAL FINISH REQUIREMENTS**

- 18 A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective
19 covering before shipping.
20 B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of
21 adjoining components are acceptable if they are within the range of approved Samples and are assembled or
22 installed to minimize contrast.
23 C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished
24 trim or border surface unless otherwise indicated.
25 D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying
26 contrasting polished finishes on raised features unless otherwise indicated.

27 **2.6 ALUMINUM FINISHES**

- 28 A. Color Anodic Finish: AAMA 611, [Class I, 0.018 mm] [Class II, 0.010 mm] or thicker.

29 **PART 3 - EXECUTION**

30 **3.1 EXAMINATION**

- 31 A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation
32 tolerances and other conditions affecting performance.
33 B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities
34 between backs of signs and support surfaces unless otherwise indicated.
35 C. Proceed with installation only after unsatisfactory conditions have been corrected.

36 **3.2 INSTALLATION OF DIMENSIONAL CHARACTERS**

- 37 A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
38 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of
39 distortion and other defects in appearance.
40 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair
41 installation.
42 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete,
43 masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
44 B. Mounting Methods:
45 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose

- 1 debris from hole and substrate surface.
2 a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive.
3 Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support
4 sign in position until adhesive fully sets.
5 b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs
6 projecting through opposite side of surface, and tighten.

7 **3.3 ADJUSTING AND CLEANING**

- 8 A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements.
9 Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by
10 finish touchup or similar minor repair procedures.
11 B. Remove temporary protective coverings and strippable films as signs are installed.

12 **END OF SECTION 10 14 19**

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2 **SECTION 10 21 13.19**
3 **SOLID PLASTIC TOILET COMPARTMENTS**

4 **PART 1 GENERAL**

5 **1.1 SECTION INCLUDES**

- 6 A. Solid plastic toilet compartments including the following:
7 1. Floor mounted overhead-braced toilet compartments.
8 2. Wall mounted urinal screens.

9 **1.2 RELATED SECTIONS**

- 10 A. Section 06 10 00 - Rough Carpentry.

11 **1.3 SUBMITTALS**

- 12 A. Product Data: Manufacturer's data sheets on each product to be used, including:
13 1. Preparation instructions and recommendations.
14 2. Storage and handling requirements and recommendations.
15 3. Installation methods.
16 B. Shop Drawings: Provide layout drawings and installation details with location and type of hardware required.
17 C. Selection Samples: For each finish product specified.
18 D. Sustainable Design Submittals:
19 1. Recycled Content: Certify percentages of post-consumer and pre-consumer recycled content.

20 **1.4 QUALITY ASSURANCE**

- 21 A. Manufacturer Qualifications: A company regularly engaged in manufacture of products specified in this section,
22 and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
23 B. Installer Qualifications: A company regularly engaged in installation of products specified in this Section, with a
24 minimum of 5 years experience.

25 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 26 A. Store products in manufacturer's unopened packaging until ready for installation.

27 **1.6 PROJECT CONDITIONS**

- 28 A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by
29 manufacturer for optimum results. Do not install products under environmental conditions outside
30 manufacturer's absolute limits.

31 **1.7 WARRANTY**

- 32 A. Manufacturer guarantees its plastic against breakage, corrosion, and delamination under normal conditions for
33 25 years from the date of receipt by the customer. If materials are found to be defective during that period for
34 reasons listed above, the materials will be replaced free of charge. (Labor not included in warranty.)

35 **PART 2 PRODUCTS**

36 **2.1 MANUFACTURERS**

- 37 A. Basis-of-Design Product: Subject to compliance with requirements, provide Eclipse Toilet Partitions by Scranton
38 Products, or a comparable product by one of the following:
39 1. Bradley Corporation.
40 2. General Partitions.
41 3. Or approved equal.

42 **2.2 MATERIAL**

- 43 A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent,
44 and graffiti-resistant textured surface;
45 1. Fire-resistance Rating: Tested in Accordance with NFPA 286.
46 2. Fire-resistance Rating: Tested to meet ASTM E84, Class B.
47 3. Standard Collection, Does not meet NFPA 286 or ASTM E84

- 1 4. Recycled Content (Post Industrial): 25 percent.
- 2 B. Aluminum Extrusions: ASTM B221, 6463-T5 alloy and temper.
- 3 C. Aluminum Die Castings: ASTM B85, A380 alloy.
- 4 D. Stainless Steel Castings: ASTM A167, Type 304.
- 5 E. Rubber: Abrasion resistant Styrene Butadiene Rubber, 65 to 80 Shore A durometer, black.

6 **2.3 SOLID PLASTIC TOILET COMPARTMENTS AND SCREENS**

- 7 A. Style: Floor mounted overhead-braced toilet compartments.
- 8 B. Doors and Panels: High density polyethylene (HDPE), fabricated from SEQ CHAPTER 1 extruded polymer resins,
9 forming single thickness panel.
 - 10 1. Waterproof and nonabsorbent, with self-lubricating surface, resistant to marks by pens, pencils,
11 markers, and other writing instruments.
 - 12 2. Thickness: 1 inch (25 mm).
 - 13 3. Edges: Shiplap.
- 14 C. Panel Color: As selected by Architect from manufacturer's full range.
- 15 D. Doors and Dividing Panels:
 - 16 1. Standard Privacy:
 - 17 a. Height: 55 inches (1397 mm) high and mounted at 14 inches (356 mm) above the finished floor.
- 18 E. Metal Posts: 82.75 inches (2102 mm) high, heavy duty extruded aluminum, clear anodized finish, fastened to
19 foot with stainless steel tamper resistant screw.
- 20 F. Hidden Shoe (Foot): One-piece molded polyethylene invisible shoe inserted into metal post and secured to
21 metal post with stainless steel tamper resistant screw.
- 22 G. Headrail Cap and Corner Cap: One-piece molded polyethylene secured to metal post with stainless steel tamper
23 resistant screw; adjustable to level headrail to finished floor.
- 24 H. Wall Brackets: Continuous heavy duty extruded aluminum, clear anodized finish, inserted into slotted panel and
25 fastened to panels with stainless steel tamper resistant screws.
 - 26 1. Type: Double ear bracket aluminum.
 - 27 2. Length: 54 inches (1372 mm).
- 28 I. Headrail: Heavy duty extruded aluminum, designer anti-grip design, clear anodized finish, fastened to headrail
29 bracket with stainless steel tamper resistant screw and to headrail cap or corner cap with stainless steel tamper
30 resistant screw.
 - 31 1. Headrail Brackets: Heavy duty extruded aluminum, clear anodized finish, secured to wall with stainless
32 steel tamper screws.
- 33 J. Door Hardware:
 - 34 1. Hinges:
 - 35 a. Edge-mounted helix style stainless steel continuous hinge.
 - 36 1) Closing degree: 5 degrees.
 - 37 2) Comes to a full close on its own weight.
 - 38 2. Occupancy Indicator Latch and Housing:
 - 39 a. Material: Satin stainless steel.
 - 40 b. Occupancy indicators: Green for occupied and red not occupied.
 - 41 c. Slide bolt and button.
 - 42 3. Coat Hook and Door Bumper Combination:
 - 43 a. Material: Chrome plated Zamak
 - 44 b. Handicap Door: Equip with second door pull and door stop.
 - 45 4. Door Pulls: Chrome plated Zamak

46 **PART 3 EXECUTION**

47 **3.1 EXAMINATION**

- 48 A. Do not begin installation until substrates have been properly prepared.
- 49 B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation
50 before proceeding.

51 **3.2 PREPARATION**

- 52 A. Clean surfaces thoroughly prior to installation.
- 53 B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the
54 substrate under the project conditions.

- 1 C. Examine areas to receive toilet partitions, screens, and shower compartments for correct height and spacing of
2 anchorage/blocking and plumbing fixtures that affect installation of partitions. Report discrepancies to the
3 architect.

4 **3.3 INSTALLATION**

- 5 A. Install in accordance with manufacturer's instructions and approved Shop Drawings.
6 B. Install partitions rigid, straight, plumb, and level.
7 C. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/8 inch (9.5 mm).
8 D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.
9 E. Finished surfaces shall be cleaned after installation and be left free of imperfections.

10 **3.4 ADJUSTING**

- 11 A. Adjust doors and latches to operate correctly.

12 **3.5 PROTECTION**

- 13 A. Protect installed products until completion of project.
14 B. Touch-up, repair or replace damaged products before Substantial Completion.

15 **END OF SECTION**

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**SECTION 10 26 00
CORNER GUARDS**

PART 1 - GENERAL

1.1 SUBMITTALS

- A. Section 01 3300 – Submittal Procedures.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Include sections, details, and attachments to other work.
- D. Samples: For each type of unit and for each color and texture required.

1.2 PERFORMANCE REQUIREMENTS

- A. Fire Performance Characteristics: Provide material conforming with the NFPA Class A fire rating. Surface burning characteristics, as determined by ASTM E-84, shall be flame spread of 25 or less and smoke development of 450 or less.
- B. System Impact Resistance: Provide a corner guard system that resists an impact of 133.3 ft-lbs while producing no visual blemishes upon the cover surface and no deformations in the retainers, as tested in accordance with the applicable provisions of ASTM F 476-84, paragraph 18, Impact Test.
- C. Impact Strength: Provide materials that have been tested in accordance with the applicable provisions of ASTM D-256, Impact Resistance of Plastics.
- D. Chemical and Stain Resistance: Provide material that shows resistance to stain when tested in accordance with applicable provisions of ASTM D-543.
- E. Fungal and Bacterial Resistance: Provide material that does not support fungal or bacterial growth as tested in accordance with ASTM G-21 and ASTM G-22.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.4 WARRANTY

- A. Standard Limited Lifetime Warranty against material and manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Construction Specialties, Inc.
 - 2. IPC Interior Protection Products, InPro Corporation – Basis-of-Design.
 - 3. Pawling Corporation.
 - 4. Approved equal.

2.2 MATERIALS

- A. Stainless-steel sheet, Type 304.
- B. Thickness: Minimum 0.0781 inch.
- C. Finish: Directional satin, No. 4.
- D. Mounting: Concealed flat-head, countersunk screws through factory-drilled mounting holes.

2.3 COMPONENTS

- A. Fasteners: All mounting system accessories appropriate for substrates indicated on the drawing shall be provided.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions in which the corner guard system will be installed.
 - 1. Complete all finishing operations, including painting, before beginning installation of corner guard system materials.
 - 2. Wall surface shall be dry and free from dirt, grease and loose paint.

**SECTION 10 28 00
TOILET AND BATH ACCESSORIES**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Public-use bathroom accessories.
2. Custodial accessories.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for blocking.
2. Division 8 Section "Mirrors" for mirrors.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: Located on Drawings.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. American Bathroom Accessories, Inc.
 2. Basco, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corporation
 5. General Accessory Manufacturing Co. (GAMCO).
 6. McKinney
 7. Taymor Industries Inc.
 8. Approved equal.

2.2 TOILET AND BATH ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser:
1. Whitehall Manufacturing; BestCare Ligature-Resistant Toilet Paper Holder, model WH1845B.
 2. Bobrick; Semi-Recessed Toilet Paper Holder, model B-9882.
- B. Soap Dispenser:
1. Behavioral Safety; Soap Dispenser, model SD750.
 2. Gojo; model Provon LTX
- C. Grab Bars at Staff Restrooms:
1. Type 304 stainless steel with satin finish.
 2. 1-1/4" diameter.
 3. Configurations and Lengths: As indicated on Drawings.
 4. Push/Pull Load: 250 pound-force, minimum.
- D. Grab Bars at Resident Restrooms:
1. American Specialties, Inc; Security Grab Bar.
 2. Whitehall Manufacturing; BestCare Ligature-Resistant Two-Wall Grab Bar.
 3. Configurations and Lengths: As indicated on Drawings.
- E. Sanitary Napkin Disposal Unit:
1. Type 304 stainless steel with satin finish.
 2. Mounting: Recessed.

**SECTION 10 44 16
FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fire Extinguishers.
2. Cabinets.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.
- D. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- E. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- F. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturer's standard materials.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - b. Larsen's Manufacturing Company.
 - c. Potter Roemer, LLC.
 - d. Or approved equal.
 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type: UL-rated, dry chemical, 10 lb. nominal capacity in manufacturer's standard enamel container.

2.3 FIRE PROTECTION CABINETS

- A. Cabinet Type: Suitable for fire extinguisher.

- 1 B. Cabinet Configuration:
- 2 1. Surface Mount: Whitehall Manufacturing; BestCare Ligature-Resistant Surface Mount Fire Extinguisher
- 3 Cabinet, model WH1754A, or approved equal.
- 4 2. Semi-Recessed: Whitehall Manufacturing; BestCare Ligature-Resistant Semi-Recessed Fire Extinguisher
- 5 Cabinet, model WH1724A, or approved equal.

6 **2.4 AED CABINETS**

- 7 A. Basis-of-Design Product: Subject to compliance with requirements, provide LifeStart 1400 Series cabinet by Activar,
- 8 or a comparable product by an approved equal.
- 9 B. Configuration:
- 10 1. Material and Finish: Steel with white power coat.
- 11 2. Edge: 3-inch, rolled edge.
- 12 3. Door: Full glazing with Saf-T-Clasp, acrylic glazing.

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14 **PART 3 - EXECUTION**

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16 **3.1 INSTALLATION**

- 17 A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed
- 18 and prepare recesses as required by type and size of cabinet and trim style.
- 19 B. Examine fire extinguishers for proper charging and tagging.
- 20 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- 21 C. Install fire protection cabinets according to manufacturer's instructions.
- 22 D. Install fire protection cabinets in locations and at mounting heights indicated on Drawings.
- 23 E. Fire Protection Cabinets: Fasten cabinets to structure square and plumb.
- 24 F. Adjust fire protection cabinet doors to operate easily and without binding. Verify that integral locking devices
- 25 operate properly.
- 26 G. Identification: Apply vinyl lettering at locations indicated.
- 27 H. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish
- 28 touchup or similar minor repair procedures.
- 29
- 30

END OF SECTION

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
- D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
 1. Tops and Bottoms: 0.064-inch nominal thickness, with single bend at edges.
 2. Backs: 0.048-inch nominal thickness.
 3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- E. Perforated Sides: Fabricated from 0.064-inch nominal-thickness steel sheet with manufacturer's standard diamond perforations.
- F. Frames: Channel formed; fabricated from 0.064-inch nominal-thickness steel sheet or 0.097-inch nominal-thickness steel angles; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
- G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
 1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
- H. Recessed Door Handle and Latch: Stainless steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in cylinder locks, or padlocks; positive automatic latching and prelocking.
 - a. Latch Hooks: Equip doors 42 inches and higher with three latch hooks and doors less than 42 inches high with two latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- I. Locks: Digital keypad locks.
- J. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 1/2 inch high.
- K. Hooks: Manufacturer's standard ball-pointed, aluminum or steel; zinc plated.
- L. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.
- M. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet to cover unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.
- N. Materials:
 1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- O. Finish: Baked enamel or powder coat.
 1. Color: As indicated on Drawings.

40 **2.3 LOCKS**

- 41 A. Digital Keypad Lock: Battery-powered electronic keypad with reprogrammable manager and owner codes that
- 42 override access. Three consecutive incorrect code entries will disable lock for three minutes.
- 43 1. Basis-of-Design Product: Electronic Built-In Locker Lock, model 3685, by Master Lock, or approved equal.
- 44 2. Designed for shared or temporary access by multiple users, with user-defined code to lock and unlock.
- 45 Provide LED indicator to show when lock is in use.

46 **2.4 FABRICATION**

- 47 A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make
- 48 exposed metal edges safe to touch and free of sharp edges and burrs.
- 49 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
- 50 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- 51 B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common
- 52 intermediate uprights separating compartments.
- 53 C. Equipment: Provide each locker with an identification plate and the following equipment:
- 54 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.

- 1 2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
- 2 3. Triple-Tier Units: One double-prong ceiling hook.
- 3 D. Knocked-Down Construction: Fabricate metal lockers by assembling at Project site, using manufacturer's nuts, bolts,
- 4 screws, or rivets.
- 5 E. Accessible Lockers: Fabricate as follows:
- 6 1. Locate bottom shelf no lower than 15 inches above the floor.
- 7 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- 8 F. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

9 **2.5 ACCESSORIES**

- 10 A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for
- 11 nuts on moving parts.
- 12 B. Anchors: Material, type, and size required for secure anchorage to each substrate.
- 13 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and
- 14 elsewhere as indicated, for corrosion resistance.
- 15 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

16 **PART 3 - EXECUTION**

17 **3.1 EXAMINATION**

- 18 A. Examine walls and floors or support bases, with Installer present, for compliance with requirements for installation
- 19 tolerances and other conditions affecting performance of the Work.
- 20 B. Proceed with installation only after unsatisfactory conditions have been corrected.

21 **3.2 INSTALLATION**

- 22 A. Install lockers level, plumb, and true; shim as required, using concealed shims.
- 23 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches
- 24 o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as
- 25 required to prevent metal distortion.
- 26 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
- 27 3. Anchor back-to-back metal lockers to floor.
- 28 B. Knocked-Down Lockers: Assemble with manufacturer's standard fasteners, with no exposed fasteners on door faces
- 29 or face frames.
- 30 C. Equipment:
- 31 1. Attach hooks with at least two fasteners.
- 32 2. Attach door locks on doors using security-type fasteners.
- 33 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
- 34 a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- 35 b. Attach plates to upper shelf of each open-front metal locker, centered, with at least two aluminum
- 36 rivets.

37 **3.3 ADJUSTING**

- 38 A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that
- 39 integral locking devices operate properly.

40 **3.4 PROTECTION**

- 41 A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- 42 B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only
- 43 materials and procedures recommended or furnished by locker manufacturer.

1

END OF SECTION 10 51 13

1 **SECTION 10 51 26**
2 **PLASTIC LOCKERS**

3 **1.1 GENERAL**

4 **SECTION INCLUDES**

- 5 A. Solid plastic lockers.

6 **SUBMITTALS**

- 7 A. Product Data: Manufacturer's data sheets for each type of product indicated include fabrication details, description
8 of materials and finishes.
9 B. Shop Drawings: Include overall locker dimensions, floor plan, elevations, sections, details, and attachments to other
10 work. Include choice of options with details.
11 C. Samples for Selection: Furnish samples of manufacturer's full range of colors for initial selection.
12 D. LEED Submittals:
13 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages
14 by weight of post-consumer and pre-consumer recycled content. Include breakout costs for each product
15 with recycled content.
16 E. Warranty: Sample of special warranty.

17 **MAINTENANCE SUBMITTALS**

- 18 A. Operation and Maintenance Data.

19 **QUALITY ASSURANCE**

- 20 A. Source Limitations: Obtain plastic lockers and trim accessories from single manufacturer.
21 B. Accessibility Requirements: Comply with requirements of ADA/ABA and with requirements of authorities having
22 jurisdiction.
23 C. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the
24 following programs, or a comparable certification acceptable to Owner:
25 1. GREENGUARD Indoor Air Quality Certified.

26 **DELIVERY, STORAGE, AND HANDLING**

- 27 A. Do not deliver plastic lockers to the site until the building is enclosed and HVAC systems are in operation. Deliver
28 plastic lockers in manufacturer's original packaging. Store in an upright condition. Protect plastic lockers from
29 exposure to direct sunlight.
30 B. Ship plastic lockers fully assembled.
31 C. Lift and handle plastic lockers from the base not the sides.

32 **WARRANTY**

- 33 A. Special Manufacturer's Warranty: 20 year against rust, delamination or breakage of plastic parts under normal use.

34 **1.2 PRODUCTS**

35 **MANUFACTURERS**

- 36 A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide Tufftec Lockers by Scranton
37 Products, or a comparable product by one of the following:
38 1. Bradley Corporation.
39 2. General Partitions.
40 3. Or an approved equal.

41 **B. MATERIALS**

- 42 1. High Density Polyethylene (HDPE): 25 percent pre-consumer recycled content polyethylene thermoplastic
43 formed under high pressure into solid plastic components.
44 2. Stainless-Steel Sheet: ASTM A 666, Type 304.
45 3. Fasteners: Tamper-Resistant Fasteners: Stainless steel torx-head screws.

- 1 Locker Connectors: No. 10-24 sex bolts.
- 2 Anchors: Type and size required for secure anchorage.
- 3 Drilled-in-place Masonry Anchors: Minimum 1/4 by 1-3/4 inch (6 by 44 mm) screws.

4 **STANDARD PLASTIC LOCKERS**

- 5 A. Locker Configuration: As shown on Drawings.
- 6 B. Locker Type-A Dimensions:
 - 7 1. Height: 36 inch (914 mm).
 - 8 2. Width: 18 inch (457 mm).
 - 9 3. Depth: 18 inch (457 mm).
- 10 C. Locker Type-C Dimensions:
 - 11 1. Height: 72 inch.
 - 12 2. Width: 18 inch.
 - 13 3. Depth: 18 inch.
- 14 D. Sides, Tops, Bottoms, Dividers, and Shelves: 3/8 inch (10 mm) thick HDPE plastic with smooth finish.
- 15 E. Locker Shelves: 3/8 inch (10 mm) HDPE plastic, mortised into sides and back.
- 16 F. Locker Tops: Flat top.
- 17 G. Doors: Fabricate from a single piece 1/2 inch (13 mm) HDPE plastic.
 - 18 1. Handle: ADA/ABA Compliant handle fabricated from injection molded plastic.
 - 19 2. Locks: Digital keypad lock.
 - 20 3. Hinges: Continuous piano hinges, .05 inch/18 gauge (1.27 mm) thick type 304 stainless steel or heavy duty
 - 21 extruded aluminum fabricated to wrap around edges of door and frame and attached with stainless steel
 - 22 tamper-resistant screws.
 - 23 4. Finish: Powder coated to match color of locker.
 - 24 5. Latch Bar: Full-height latch bar constructed of 1/2 inch (13 mm) Black HDPE plastic secured to locker with
 - 25 stainless steel tamper-resistant screws.
- 26 H. Color: As selected by Architect from manufacturer's full range.
- 27 I. Accessories:
 - 28 1. Coat Hooks: Black polycarbonate double hook.
 - 29 2. End Panels: 3/8 inch (10 mm) thick, with color and finish matching locker body.
 - 30 3. Filler Panels: 1/2 inch (13 mm) HDPE filler panel, with color and finish matching locker body, attached with
 - 31 3/8 inch (10 mm) thick HDPE solid plastic angle bracket.
 - 32 4. Wall Hooks: Black powder coated, cast zinc hook one per locker.
 - 33 5. Number Plate: White acrylic with black film coating, laser etched with number specified. Provide one per
 - 34 locker.
 - 35 6. Locker Base: 1 inch (26 mm) solid HDPE plastic, with black or finish matching locker body, 4 inch (101 mm)
 - 36 high.

37 **LOCKER FABRICATION**

- 38 A. Fabricate locker box from a single sheet of HDPE solid plastic with corners fused together. Weld frames and shelves
- 39 to box assembly. Provide all welded construction of locker parts without dovetail slots or metal fasteners. Add
- 40 welded gussets in single tier full height lockers.
- 41 B. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.
- 42 C. Hardware Attachment: All hinges, handles, hasps, hooks, latch bars, and locks attached with tamper-resistant screws.
- 43 D. Provide ventilated panels where indicated.
- 44 E. Continuous Base: Set toe clearance 3 inch (76 mm) from locker front. Notch end caps for ease of installation.

45 **1.3 EXECUTION**

46 **INSTALLATION**

- 47 A. Install lockers in climate-controlled environment, shielded from direct sunlight.
- 48 B. General: Install on floor or other firm support. Install level, plumb, and true.
 - 49 a. Position locker base per approved shop drawing. Using fasteners provided by manufacturer, anchor
 - 50 base sections to the floor.
 - 51 b. Attach filler pieces to lockers with male-female sex bolts.
 - 52 c. Position first locker according to submittal layout. Square and plumb the locker using concealed
 - 53 shims. Secure the locker to the wall at the top and bottom of the locker. Position second locker next

- 1 to first, square and plumb to align the tops and bottoms; and temporarily clamp lockers together.
2 Drill four holes through the sides of the lockers and connect lockers using sex bolts provided by
3 manufacturer.
- 4 C. Accessories: Fit exposed connections of trim, fillers, and closures together to form tight, hairline joints, with
5 concealed fasteners and splice plates furnished by locker manufacturer. Install as indicated on approved shop
6 drawings.
- 7 a. Coat Hooks: Attached with at least two fasteners.
8 b. Identification Plates: Identify plastic lockers with approved identification numbers. Attach plates to
9 each locker door.
10 c. Filler Panels: Attach with concealed fasteners.
11 d. Finished End Panels: Attach at ends indicated.

12 **FINAL CLEANING**

- 13 A. Clean locker interior and exterior surfaces.
14 B. Remove packaging and construction debris and legally dispose of off-site.

15 **END OF SECTION**

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SECTION 10 73 00
CANOPIES

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2

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section includes the structural canopy system as shown and specified. Work includes providing and installing:
6 1. Structural aluminum box beam superstructure
7 2. Factory prefabricated structural insulated translucent sandwich panels
8 3. Aluminum installation system
9 B. Related Sections:
10 1. 03 3000 "Cast-in-Place Concrete".

11 **1.2 SUBMITTALS**

- 12 A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of
13 components.
14 B. Submit shop drawings. Include plans, elevations and details.
15 C. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.
16 D. Submit product reports from a qualified independent testing agency indicating each type and class of panel system
17 complies with the project performance requirements, based on comprehensive testing of current products.
18 Previously completed reports will be acceptable if for current manufacturer and indicative of products used on
19 this project.
20 1. Reports required (if applicable) are:
21 a. International Building Code Evaluation Report (AC 177)
22 b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
23 c. Burn Extent (ASTM D 635)
24 d. Color Difference (ASTM D 2244)
25 e. Impact Strength (UL 972)
26 f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
27 g. Bond Shear Strength (ASTM D 1002)
28 h. Beam Bending Strength (ASTM E 72)
29 i. Insulation U-Factor (NFRC 100 or ASTM C-236)
30 j. 1200°F Fire Resistance (SWRI)
31 k. Fall Through Resistance (ASTM E 661)
32 l. Class A Roof Covering Burning Brand (ASTM E 108)
33 m. (Optional) UL Listed Class A Roof System (UL 790)– Submit UL Card

34 **1.3 CLOSEOUT SUBMITTALS**

- 35 A. Provide project maintenance manuals.

36 **1.4 QUALITY ASSURANCE**

- 37 A. Manufacturer's Qualifications:
38 1. Material and products shall be manufactured by a company continuously and regularly employed in the
39 manufacture of specified materials for a period of at least ten consecutive years and which can show
40 evidence of those materials being satisfactorily used on at least six projects of similar size, scope and
41 location. At least three of the projects shall have been in successful use for ten years or longer.
42 2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control
43 inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited
44 agency.
45 3. Quality control inspections shall be conducted at least once each year and shall include manufacturing
46 facilities, sandwich panel components and production sandwich panels for conformance with AC177
47 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by
48 the ICC-ES.

- 1 B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of
2 installing specified panel systems for at least two consecutive years and can show evidence of satisfactory
3 completion of projects of similar size, scope and type.

4 **1.5 PERFORMANCE REQUIREMENTS**

- 5 A. The manufacturer shall be responsible for the configuration and fabrication of the complete canopy system,
6 including the aluminum box beam superstructure.
7 1. When requested, include structural analysis data signed and sealed by the qualified professional engineer
8 responsible for their preparation.
9 2. Structural Loads; Provide canopy system capable of handling the following loads:
10 a. Roof Snow Load, on horizontal projected surface, minimum: 45.5 PSF
11 b. Roof Snow Drift Load, on horizontal projected surface, minimum:
12 1) Drift Height: 4.1 feet.
13 2) Drift Depth: 16.6 feet.
14 3) Peak Drift Snow Load: 87.1 psf.
15 c. Base Wind Load <Insert Number> PSF factored per applicable Building Code
16 B. Deflection Limits:
17 1. Canopy Panels: Limited to L/60 of clear span.

18 **1.6 DELIVERY, STORAGE AND HANDLING**

- 19 A. Deliver canopy system, components, and materials in manufacturer's standard protective packaging.
20 B. Store canopy system panels on the long edge; several inches above the ground, blocked and under cover to prevent
21 warping in accordance with manufacturer's storage and handling instructions.

22 **1.7 WARRANTY**

- 23 A. Provide manufacturer's and installer's written warranty agreeing to repair or replace canopy system work, which
24 fails in materials or workmanship within one year from the date of delivery. Failure of materials or workmanship
25 shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects
26 in accessories, insulated translucent sandwich panels and other components of the work.
27 B. Extended Panel Warranty: 10 years from date of delivery.
28 C. Extended Manufacturer's factory applied Finish Warranty: 10 years from date of delivery.

29 **PART 2 - PRODUCTS**

30 **2.1 MANUFACTURER**

- 31 A. Basis-of-Design Product: Subject to compliance with requirements, provide Structures Unlimited canopy system or
32 comparable product by one of the following:
33 1. Approved equal.

34 **2.2 PANEL COMPONENTS**

- 35 A. Face Sheets:
36 1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for
37 architectural use.
38 a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
39 b. Face sheets shall not deform, deflect, or drip when subjected to fire or flame.
40 2. Interior face sheets:
41 a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting,
42 with flame spread rating no greater than 10 and smoke developed no greater than 350-400 when
43 tested in accordance with UL 723.
44 b. Burn extent by ASTM D 635 shall be no greater than 1".

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3. Exterior face sheets:
 - a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 3 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
 - b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by handheld pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
 - c. Erosion Protection: Integral, embedded-glass erosion barrier.
 4. Appearance:
 - a. Exterior face sheet: Smooth, 0.070-inch thick and crystal in color.
 - b. Interior face sheet: Smooth, 0.045-inch thick and white in color.
 - c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.
 - B. Grid Core:
 1. Aluminum I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
 2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.
 - C. Laminate Adhesive:
 1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
 2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
 3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
 - a. 50% Relative Humidity at 68° F: 540 PSI
 - b. 182° F: 100 PSI
 - c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
 - d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

31 **2.3 PANEL CONSTRUCTION**

- 32 A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of
- 33 mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-
- 34 beam and have a neat, sharp edge.
 - 35 1. Thickness: 2 3/4"
 - 36 2. Light transmission: 37%
 - 37 3. Solar heat gain coefficient: 0.44
 - 38 4. Panel U-factor: 0.53
 - 39 5. Grid pattern: Nominal size 12" x 24"; pattern shoji
- 40 B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10'-0" span without a supporting frame by ASTM E 72.
- 41 C. Standard panels shall withstand 1200° F fire for a minimum of one hour without collapse or exterior flaming.
- 42 D. Canopy System:
 - 43 1. The canopy system shall pass Class A Roof Burning Brand Test by ASTM E 108.
 - 44 2. (Optional) Roof system shall be UL listed as a Class A Roof by UL 790, which requires periodic unannounced
 - 45 factory inspections and retesting by Underwriters Laboratories.
- 46 E. The Canopy System shall meet the fall through requirements of OSHA 1910.23 as demonstrated by testing in
- 47 accordance with ASTM E 661, thereby not requiring supplemental screens or railings.

48 **2.4 BATTENS AND PERIMETER CLOSURE SYSTEM**

- 49 A. Closure system: Extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.
- 50 B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.
- 51 C. Fasteners: Various series stainless steel screws for aluminum closures, excluding final fasteners to the building.
- 52 D. Finish: Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to
- 53 be Hartford Green #75.

**SECTION 10 75 16
GROUND-SET FLAGPOLES**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes ground-mounted aluminum flagpoles.
- B. Related Sections:
 - 1. Division 03 Section "Cast-in-Place Concrete."
 - 2. Division 07 Section "Joint Sealants."

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements" to design flagpole assemblies.
- B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
 - 1. Wind Loads: Determine according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles" for basic wind speed for Project location.
 - 2. Base flagpole design on polyester flags of maximum standard size suitable for use with flagpole.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes.
- B. Shop Drawings: Submit Shop Drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.
- C. Delegated Design Submittal: For flagpoles.
- D. Samples: Submit samples of each finished metal for flagpoles and accessories as may be requested.
- E. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases, and anchorage devices.
- B. Pole Construction: Construct pole and ship to site in one piece, if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning internal sleeve arrangement for weather-tight hairline field joints.
- C. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy Kraft paper or other protective wrapping and prepare for shipment in hard fiber tube or other protective container.
- B. Deliver flagpoles and accessories completely identified for installation procedure. Handle and store flagpoles to prevent damage or soiling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acme Flagpole Company.
 - 2. American Flagpole.
 - 3. Eder Flag Manufacturing Company, Inc.
 - 4. Pole-Tech Company Inc.
 - 5. Approved Equal.

2.2 FLAGPOLES

- A. Exposed Height: See Drawings.

1 B. Aluminum Flagpoles: Fabricate from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063,
2 having a minimum wall thickness of 3/16 inch, tensile strength of not less than 30,000 psi and a yield point of
3 25,000 psi. Heat-treat and age-harden after fabrication.

4
5 1. Provide cone tapered aluminum flagpoles.

6
7 **2.3 FLAGPOLE MOUNTING**

8 A. Provide manufacturer's standard base system for the type of flagpole installation required.

9 B. Base Plate: For anchor-bolt mounting, furnish manufacturer's standard cast metal shoe base of same material as
10 flagpole. Furnish and install anchor bolts and lightning ground spike as required.

11 C. Foundation Tube: For ground-set flagpoles, provide 16-gage minimum galvanized corrugated steel tube, or 12 gage
12 rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support
13 plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose hardwood wedges
14 at top for plumbing pole after erection. Galvanized steel parts after assembly, including foundation tube.

15 D. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete
16 foundation.

17
18 **2.4 SHAFT FINISH**

19 A. Aluminum: Fine, directional, mechanical satin polish (NAAMM-M32), finished as follows:

20
21 1. Buff and seal aluminum surfaces with clear, hardcoat wax.

22
23 **2.5 FITTINGS**

24 A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt
25 diameter. Fabricate from 0.063-inch spun aluminum, finished to match flagpole.

26 B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-
27 steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide
28 flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

29
30 **2.6 MISCELLANEOUS MATERIALS**

31 A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with
32 ASTM C 1107.

33 B. Concrete Base and Footing: See Section 03 3000 for concrete and drainage material.

34 C. Elastomeric Joint Sealant: Joint sealant complying with requirements in Division 07 Section "Joint Sealants."

35
36 **2.7 ALUMINUM FINISHES**

37 A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum
38 surfaces with clear, hard-coat wax.

39
40 **PART 3 - EXECUTION**

41
42 **3.1 FLAGPOLE INSTALLATION**

43 A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

44
45 1. Paint portions of ground-set flagpole below grade with a heavy coat of bituminous paint.

46 B. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required
47 due to unstable soil conditions. Remove wood, loose soil, rubbish, and other foreign matter from excavation, and
48 moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

49 C. Concrete: Provide concrete composed of Portland cement, coarse and fine aggregate and water, mixed in
50 proportions to attain 28-day compressive strength of not less than 3,000 psi, complying with ASTM C94.

51 D. Place concrete immediately after mixing. Perform chuting to avoid segregation of mix. Compact concrete in place
52 by use of vibrators. Moist-cure exposed concrete for not less than seven (7) days, or use a non-staining curing
53 compound in cold weather.

54 E. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Install flagpole,
55 plumb, in foundation tube. Place tube seated on bottom plate between steel centering wedges and install hardwood
56 wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal
57 top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

- 1 F. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor
- 2 bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate
- 3 solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from
- 4 edges of baseplate.
- 5 G. Finish trowel exposed concrete surfaces to smooth, dense surface. Provide positive slope for water runoff to base
- 6 perimeter.
- 7 H. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as
- 8 indicated on Shop Drawings.
- 9 I. Provide positive lightning ground for each flagpole installation.

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11

END OF SECTION

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SECTION 10 82 00
TRELLIS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Living wall trellis system.

1.2 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's data sheets on each product to be used.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Typical installation methods.
 - 5. Sufficient data and detail to indicate compliance with these specifications.
- B. Color Selection: Submit paint chart with full range of colors available for Architect's selection. Custom color samples available upon purchase.
- C. Shop Drawings: Indicate layout heights, component connection details, and details of interface with adjacent construction.
 - 1. Wall area to be screened.
 - 2. Number of individual panels desired.
 - 3. Type of mounting System: Wall material to be attached to, direct bury of posts or surface mounted posts system.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of one year documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- B. Storage and Handling: Keep product in original package until ready to install to protect materials and finishes during handling and installation.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
- B. Field Measurements: Take measurements of actual openings to be screened. Indicate measurements on shop drawings fully documenting any field condition that may interfere with the screen system installation.

1.6 COORDINATION

- A. Installer for work under this Section shall be responsible for coordination of panel and framing sizes and required options with the Contractor's requirements.
- B. Submit shop drawings to the Contractor and obtain written approval of shop drawing from the Contractor prior to fabrication.

1.7 WARRANTY

- A. If any part of the NatureScreen system fails because of a manufacturing defect within 5 years from the date of substantial completion, the manufacturer will furnish without charge the required replacement parts. Any local transportation, related service labor or diagnostic call charges are not included.
- B. This warranty does not cover failure of your NatureScreen System if the Owner damages it, or if the failure is caused by improper installation. In no event shall Warrantor be liable for incidental or consequential damages.

1 **PART 2 PRODUCTS**

2 **2.1 MANUFACTURERS**

- 3 A. Subject to compliance with requirements, provide NatureScreen GMT System by CityScapes International Inc.,
4 or comparable product by one of the following:
5 1. Tournesol - Greenscreen.
6 2. McNichols – Wire Mesh.
7 3. Or approved equal.

8 **2.2 PERFORMANCE AND DESIGN REQUIREMENTS**

- 9 A. Regulatory Requirements: Comply with requirements of building authorities having jurisdiction in Project
10 location.
11 B. Design Criteria:
12 1. Manufacturer is responsible for the structural design of all materials, assembly, and attachments to
13 resist snow, wind, suction, and uplift loading at any point without damage or permanent set.
14 2. Framing shall be designed in accordance with the Aluminum Design Manual to resist the following
15 loading:
16 a. ASCE 7-18 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil
17 Engineers.

18 **2.3 MATERIALS**

- 19 A. Frame: Extruded Aluminum Alloy 6005-T5. Wall Thickness: 0.063 inches (1.60 mm).
20 B. Frame Width:
21 1. Frame Size DMT: 3 x 1 inch (76 x 25 mm).
22 C. Wall Mount Bracket: Aluminum Alloy 6005- T5. Wall Thickness: 0.090 inches (2.29 mm).
23 1. Finish: Powder coat.
24 D. Metal Mesh Panels:
25 1. Material: Stainless steel.
26 2. Mesh Grid Size: 2 x 2 inch (51 x 51 mm).
27 3. Panel Size: See Drawings.
28 E. Threaded Fasteners: Screws, Bolts, Nuts and Washers: Stainless steel.

29 **2.4 FABRICATION**

- 30 A. Panel Design: Straight.
31 B. Panels: Fabricated and shipped as assembled units.

32 **2.5 FINISHES**

- 33 A. Aluminum Framing: Powder Coated finish.
34 1. Color: City Green Textured.

35 **PART 3 EXECUTION**

36 **3.1 EXAMINATION**

- 37 A. Installer's Examination: Examine conditions under which construction activities of this section are to be
38 performed.
39 1. Submit written notification to Architect and Screen manufacturer if such conditions are unacceptable.
40 2. Beginning erection constitutes installer's acceptance of conditions.

41 **3.2 PREPARATION**

- 42 A. Clean surfaces thoroughly prior to installation.
43 B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the
44 substrate under the project conditions.

45 **3.3 INSTALLATION**

- 46 A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with
47 adjacent construction.
48 1. Post Mounted NatureScreen Span Between Structural Supports:
49 a. Do not exceed 120 inches (3048 mm) without review of site specific site conditions.

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**SECTION 11 23 00
LAUNDRY EQUIPMENT**

PART ONE - GENERAL

1.1 RELATED DOCUMENTS

A. Applicable provisions of Division 1 shall govern work in this section.

1.2 MISCELLANEOUS DEFINITIONS AND ABBREVIATIONS

A. The term "**furnish**" (materials) as used in this Section means to supply and deliver to the project ready for installation and in operable condition.

B. The term "**install**" (services or labor) as used in this Section means to place in final position, complete, anchored, connected and in operable condition.

C. The term "**provide**" as used in this Section in connection with labor materials and equipment (other than Owner purchased products), means pay for, furnish and install, complete, ready for final connections by other contractors.

D. Abbreviations:

ADA	Americans with Disabilities Act
AFF	Above finished floor
AGA	American Gas Association
ASME	American Society of Mechanical Engineers
CFM	Cubic feet per minute
D.O.	Duplex outlet
DCO	Duplex convenience outlet
EC	Electrical Contractor
F.D.	Floor drain
CM	Construction Manager
HVAC	Heating, Ventilating and Air Conditioning Contractor
LEC	Laundry Equipment Contractor
MC	Mechanical Contractor
PC	Plumbing Contractor
U.L.	Underwriters Laboratories

1.3 DESCRIPTION

A. The work included in Section 11 23 00 consists of furnishing all plans, labor, equipment, fabrication, warehousing, transportation, delivery, handling, uncrating, assembly and setting in place. Demonstrate equipment and perform all work necessary for the complete installation of all laundry work.

B. The work shall be in accordance with all Contract Documents and shall include miscellaneous work and material which is reasonably inferred and necessary for completion.

C. Provide a knowledgeable and competent jobsite foreman as a project coordinator.

D. Coordinate with applicable contractors for all plumbing, electrical and mechanical rough-ins, masonry curbs and floor depressions.

E. Verify available utility services and provide equipment accordingly.

- 1
2 F. Make minor changes in equipment location as directed by the Owner or his representative.
3
4 G. Verify rough-in locations and advise Owner's representative of any discrepancies prior to pouring of floors or closing of
5 walls. Verify all plumbing, electrical and mechanical requirements of new, existing and owner-furnished laundry
6 equipment. Verify all field dimensions and existing equipment dimensions. Verify access into building and to final
7 installation point for delivery of equipment.
8
- 9 **1.4 RELATED WORK BY OTHER CONTRACTORS**
- 10
- 11 A. CONSTRUCTION MANAGER (CM)
- 12
- 13 1. Provide transit-level recesses for depressions as indicated on the drawings. Furnish and install floor troughs for
14 washers/extractors as shown on the laundry drawings.
15
- 16 2. Provide dryer enclosure where indicated on the laundry drawings.
17
- 18 3. Provide core drilling and sleeves in floors as shown on the Drawings.
19
- 20 4. Provide concealed wall backing of size and type and at locations indicated on shop drawings submitted by the
21 LEC.
22
- 23 B. PLUMBING CONTRACTOR (PC)
- 24
- 25 1. Rough-in and make final connections of all services. Flush all lines of foreign matter before connecting fixtures.
26
- 27 2. Provide all water supply and drain lines, drain fittings, floor drains, valves, traps, tailpieces, pressure reducing
28 valves and vacuum breakers unless indicated in the Plumbing Schedule as furnished by the LEC.
29
- 30 3. Install all vacuum breakers, check valves, flow control valves, water inlets, traps, filters, strainers, PRV valves, T/P
31 gauges, etc. furnished by the LEC and indicated on the Plumbing Schedule. Exposed piping or fixtures shall not
32 show tool marks. Horizontal piping shall be run at the highest elevation and not less than 6" AFF.
33
- 34 4. Provide all gas pressure reducing and regulating valves for pressure above 14" W.C., and gas shut-off valves unless
35 indicated in the Plumbing Schedule as furnished by the LEC.
36
- 37 5. Install all gas valves, gas pressure regulators, etc., furnished by the LEC and indicated on the Plumbing Schedule.
38 Exposed piping or fixtures shall not show tool marks. Horizontal piping shall be run at the highest elevation and
39 not less than 6" AFF.
- 40 C. ELECTRICAL CONTRACTOR (EC)
- 41
- 42 1. Provide rough-in and final connections of all services. Wet areas shall be wired with Sealtite Type EF or equal, in
43 water-proof boxes.
44
- 45 2. Provide receptacles (GFI), conduit, contactors, controllers, switches, disconnects, starters, etc., unless indicated
46 in the Electrical Schedule as furnished by the LEC.
47
- 48 3. Install electrical devices furnished by LEC and indicated on Electrical Schedule.
49
- 50 D. MECHANICAL CONTRACTOR (MC)
- 51
- 52 1. Provide rough-in and final connections of all services. Flush all lines of foreign matter before connecting fixtures.
53
- 54 2. Provide ducts, fans, dampers, starters, etc., necessary for operation of equipment. All equipment is power
55 exhausted. Provide booster fans on runs exceeding 14 (fourteen) feet with two 90 degree elbows.

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1.5 QUALITY ASSURANCE

- A. Comply with all federal, state and local laws and regulations governing materials, installation, health, safety, fire, mechanical and electrical requirements within the applicable jurisdiction. Furnish all laundry equipment-related permits, approvals and inspections as required.
- B. Comply with Standards of ADA, AGA, ASHRAE, ASME, NEMA, NEC, NFPA, OSHA and UL.
- C. Use UL Listed electrical components and include UL labels.
- D. When the Contract Documents call for higher standards or larger sizes than the regulations, the Contract Documents shall govern. When the regulations require higher standards or larger sizes than the Contract Documents, the regulations shall govern. Rulings and interpretations of the enforcing agencies shall be considered a part of the regulations. No additional amounts shall be paid for such compliance.
- E. If, because of jurisdictional trade agreements or other conditions, any work specified in the Contract Documents must be done by others, sublet such work only to those who are qualified to do such work or make other arrangements at the expense of the LEC, subject to approval by the Architect.

1.6 GUARANTEE

- A. Equipment provided under this Contract shall be guaranteed for parts and labor for a period of one (1) calendar year from date of acceptance by the Owner as determined by the Owner and Architect. Any parts requiring replacement due to defective material or workmanship during this period shall be promptly replaced with new parts and installed at no cost to Owner.
- B. Equipment shall be serviced within a reasonable time by a competent and factory-trained local service agency. When an equipment breakdown occurs, service shall be performed within 24 hours of the request. If the necessary repairs or replacements are not made promptly, the Owner may have the necessary repairs and replacements made and charge the costs to the LEC.

1.7 SUBMITTALS

- A. Submit shop and rough-in drawings, schedules and three buy-out brochure booklets within 30 days of award of contract or as required by the Architect. Submit three copies of each drawing sheet for review. Electronic shop drawings and rough-in drawings, when required by the Architect shall be in AutoCAD or AutoCAD compatible format and buy-out books shall be in Word or PDF format. Architect or GC shall forward to the Laundry Consultant all buy-out manuals and all drawings for review. Drawings shall be sent rolled up and in a tube. Buy-out manuals shall be assembled in hard-cover three-ring binders with one electronic copy. Corrected brochure manuals and drawings will be returned by the Foodservice Consultant for revisions by the LEC. Repeat until all corrections are satisfactorily made. FEC shall be responsible for any utility costs associated with deviation from Foodservice drawings and specifications.
- B. When drawings are approved, submit assembled sets of prints in quantity required by the Architect.
- C. When brochures are approved submit assembled brochures in quantity required by the Architect. Provide a numbered cover sheet for each Item that includes a copy of the Specification for that Item. Brochures are to indicate accessories and components used with each item. Cross out models or accessories shown on catalog sheets but not required by the specifications.
- D. Drawings shall include:
 - 1. Itemized plumbing, electrical and mechanical requirement schedules showing quantities, all required services,

- 1 sizes and all accessories furnished by the LEC for installation by the applicable trades.
2
3 2. Plumbing, electrical and mechanical rough-in plans in 1/4" scale. Rough-in drawings included with the Contract
4 Documents may be used only with the written permission of the Laundry Consultant. When such drawings are
5 used it shall be the responsibility of the LEC to verify all dimensions and plumbing, electrical and mechanical
6 services and prevailing codes as they relate to this Project and to show any required changes on the documents
7 submitted for approval. Plans are to show location, elevation, size and type of water supplies, drains, gas lines,
8 floor drains, site drains, electrical supplies, outlets, switches, etc. Rough-in dimensions shall be located from
9 readily identifiable column centers and finished walls as drawn by the Architect. Include on each drawing page a
10 legend of commonly used symbols and abbreviations.
11
12 3. Recesses, sleeves, concealed wall blocking, pass-thru openings, trenches, etc., in 1/4" to 3/4" scale.
13
14 4. Owner's existing equipment, Owner-furnished equipment and future equipment.
15
16 5. Plans, elevations, sections and details for all fabricated items, etc.
17
18 E. Submit shop drawings showing plans, elevations and details for all fabricated items in minimum 3/4" scale. Detailed
19 sections shall be 1 1/2" scale or larger. Shop drawing paper size shall be a minimum of 24" x 36".
20
21 F. Show all details of construction, anchorings, reinforcements and relationship to adjoining work. Provide drawings
22 indicating type, size and location of concealed anchorages of adequate size and strength to securely mount any wall-hung
23 equipment.
24
25 G. When approved drawings and buy-out brochures are received by the Owner and Architect, fabrication may begin. The
26 approvals shall not relieve the LEC of responsibility for conformance with the Contract Documents unless written approval
27 of change is obtained from the Owner or the Owner's representative.
28
29 H. Prior to demonstration and final inspection submit three copies of operation and maintenance manuals to Architect or
30 CM for approval. Manuals shall be in hard cover three-ring binders and shall include replacement parts lists and a
31 typewritten sheet listing names, addresses and phone numbers of all service agencies to be involved, with reference to
32 the names and item numbers of the pieces of equipment each services. Provide a typewritten index sheet showing, in
33 numerical order, the item numbers and corresponding model and serial number for each piece of equipment. Provide a
34 cover sheet listing the name, address and phone number of the Architect, LEC and the Laundry Consultant.
35
36 I. Should the contract for laundry equipment be awarded after the plumbing, electrical and mechanical services have been
37 roughed-in, verify the locations of all such services etc., and incorporate them in the drawings. If the inspection reveals
38 that the existing conditions seriously interfere with the execution of the Work, report these conditions to the Architect
39 and await instructions before proceeding with that portion of his drawings.
40

41 **1.8 PRODUCT DELIVERY, HANDLING AND STORAGE**

- 42
43 A. All shipments shall be made freight prepaid.
44
45 B. Do not deliver equipment until authorized by the CM. Verify storage areas with the CM prior to delivery. Verify delivery
46 route and access prior to fabrication or installation.
47
48 C. Equipment shall be wrapped and crated at the factory and shall be delivered in undamaged condition. LEC shall be
49 responsible for loss or damage to equipment until final inspection and acceptance by the Owner. Store all equipment and
50 materials in such a manner as to prevent damage due to moisture, foreign material or impact.
51

1 **PART TWO - PRODUCTS**

2
3 **2.1 GENERAL**

- 4
5 A. All equipment shall be manufacturer's latest model. Unless otherwise specified, an item of equipment specified by model
6 number shall include all accessories the manufacturer includes as standard with the equipment as well as specified
7 optional accessories.
8
9 B. The manufacturing facilities used for fabricated equipment shall at all times be accessible for the Architect and Consultant
10 to inspect the materials and general construction and progress of the Work.
11

12 **2.2 CUSTOM FABRICATION**

- 13
14 A. All custom fabricated equipment as described in the Item Specifications shall be of uniform design and finish and shall
15 be fabricated by one manufacturer.
16
17 B. Stainless steel shall be 18-8 Type 304, ASTM Specification A167, #4 finish, ASTM Specification A480. Sheets shall be
18 free of warps, buckles, pits and scratches. Galvanized steel shall meet ASTM Standard A446. All edges, corners and
19 welds shall be ground and polished smooth. Unless specified otherwise the following metal gauges shall be used:
20 10 gauge: Gusset plates.
21 12 gauge: Hardware reinforcement, channels.
22 14 gauge: Table tops, sinks, splash shields, drainboards, slanting rackselves and shelf brackets.
23 16 gauge: Undershelves, overshelves, wall shelves, drawer fronts and access panels, double pan doors.
24 18 gauge: Cabinet bodies, drawer pans, skirts, closure panels, trim strips, exhaust hoods.
25
26 C. Standard table top edges shall be turned down square 1 1/4" with 1/4" turn back angled downward 15 degrees.
27
28 D. Reinforce tops with welded galvanized or S/S U-channels, closed welded hat channels or painted angle iron, lengthwise
29 and with crossbraces 30" O.C. minimum and at each pair of legs. Intersections of channels shall be fully welded. Tack
30 welding of channel intersections will not be accepted.
31
32 E. Standard backsplashes shall be 10" high with 2" return to wall on 45 degree and then down 1/2" at rear. Ends shall be
33 closed and welded. Cove the intersections of all back and endsplashes and raised rolled rims on tables, dishtables and
34 drainboards a minimum of 3/4", horizontally and vertically.
35
36 F. Fasten tops to bases with studs welded to underside and capped with locking chrome acorn nuts. No exposed bolt or
37 stud threads will be permitted on fabricated equipment.
38
39 G. Enclosed and semi-enclosed cabinet bases shall have flush fully welded mullion facings. Vertical partition dividers shall
40 have #4 finish on both sides. Concealed partitions to be galvanized. Sections and framework behind cabinet doors shall
41 be S/S.
42
43 H. Pipe stands and frames shall be fabricated of 1 5/8" O.D. 16 ga. Type 304 S/S tubing with continuously fillet welded
44 cross bracing. Welds shall be ground and polished smooth. Legs to have S/S adjustable feet and S/S enclosed gussets
45 welded to galvanized or S/S channel. Gussets shall be Component Hardware #A18-0206 or equal. Adjustable flanged
46 feet are to be S/S, anchored with S/S fasteners.
47
48 I. Doors shall be of welded double pan construction, 3/4" thick, with sound deadening core and channel bracing.
49 Equip hinged doors with Component Hardware #P63-1012 recessed S/S handles and #M21-2580 mechanical catches
50 with spring action nylon rollers. Hinged doors are to have heavy duty S/S lift-off hinges and are to be mounted flush
51 with cabinet body.
52
53 J. Drawers shall be provided with Component Hardware Series S52 heavy duty slides, 200# load capacity per pair. Install
54 on angle of 1/2" in 12" to provide self-closing operation. Mount slides to an 18 ga. S/S channel-type three-sided housing
55 having an open bottom with two welded S/S channel cross braces. Drawer housings are not to be considered as

- 1 crossbracing for table tops. Drawer front shall be of 16 ga. S/S double pan construction with fiberboard insulation
2 between. Each drawer shall have continuous top pull as shown on the Drawings. Drawer pan holder shall be 16 ga. S/S
3 and shall be tack welded to back of drawer front and sealed with silicone. Drawer pans shall be stamped 18 ga. S/S,
4 20" x 20" x 5" or other sizes as specified and shall be easily removable without the use of tools. Include drawer stops
5 and Component Hardware #Q20-2081 rubber cushion bumpers.
6
- 7 K. Undershelves on open base tables shall be fully welded or removable, as specified. Welded type shall have edges
8 turned down to match table tops. Undershelves of 20" or more in width shall be reinforced with welded S/S or
9 galvanized U-channels or angles, lengthwise and with crossbraces 30" O.C. minimum and at each pair of legs.
10 Intersections of bracing shall be welded as described for table top bracing. Removable shelves shall be sectional with
11 no section larger than 27"x 33" and with edges rolled to conform to the crossbracing and stretchers. Grind and polish
12 all edges and corners of removable shelves.
13
- 14 L. Undershelves in cabinet bodies shall be 16 ga. S/S, formed with the back and ends turned up 1 1/2", coved, welded and
15 sealed to the cabinet body, with front edge and reinforcement as described for open base tables.
16
- 17 M. Table overshelves shall have edges matching that described for table tops. Supports shall be 1 1/4" diameter S/S tubing
18 with nuts welded in bottom of tube and bolted from below. Provide channel under table surface where bolts penetrate.
19 Table overshelves over 12" wide shall have enclosed S/S longitudinal inverted hat channel bracing. Cantilever supports
20 (flags) shall be 14 ga. S/S, welded. Standards passing through an angled backsplash shall be thru close-fitting oval holes.
21 Bolt cantilevered standards to heavy gauge flanges welded to the underside of the table. Standards for splash-mounted
22 overshelves shall be not more than 60" O.C.
23
- 24 N. Wall-mounted shelves shall be similar in construction to table overshelves, supported on 14 ga. S/S brackets.
25
- 26 O. Sinks shall be 14 ga. S/S with intersections and corners coved a minimum of 3/4". No soldered filleted corners will be
27 accepted. Sinks with two or more compartments shall have fully welded double wall partitions. No evidence of welding
28 shall appear. Trim bands will not be permitted. Provide an 18 ga. S/S apron covering the front of multiple bowl sinks.
29 Crease bottom of sink four ways to recessed drain cup. Backsplash shall be 10" high, of same description as table
30 splashes. Grain of splash shall match grain of rear of bowls. Sink legs, rails, gussets, feet, underbracing and shelves
31 shall be to same specification as tables.
32
- 33 P. Provide brackets for rotary drain handles, attached with welded studs and acorn nuts. Brackets for disposer control
34 switches, control panels and mixing valves shall be fully welded to sink or table or shall be welded to a full depth
35 U-channel which is attached to the sink or table by not less than six spot-welded studs.
36
- 37 Q. Drainboards shall be 14 gauge S/S, integrally welded with straight rolled rim at front. Pitch drainboards toward sinks.
38
- 39 R. Hardware and buy-out accessories shall be identified on the shop drawings on a bill of material, subject to approval.
40
- 41 S. Prewiring of electrical items to junction boxes or circuit breaker panels shall comply with UL, NEMA, NEC and prevailing
42 codes.
43
- 44 T. Where U.L. Listed equipment assemblies with electrical circuit breaker panels are specified for custom fabricated
45 equipment, the equipment shall be fabricated in a U.L. Listed shop.
46
- 47 U. Field wiring and U.L. field certification shall not be acceptable. Identify all circuits by typewritten index. Provide all
48 panel spaces with breakers or dummies.
49
- 50 V. Internal wiring specified for custom fabricated equipment shall be identified with tags indicating item number and
51 electrical characteristics. Furnish wiring diagrams. Wiring shall run in rigid conduit, zinc coated where concealed and
52 chrome or S/S where exposed. Wire wet areas in Sealtite Type EF conduit or equal. Provide conduit raceways where
53 possible. NEMA #4 standards shall apply to all splash areas. Final connections by EC.
54

- 1 W. Exposed junction boxes for switches and receptacles shall be S/S or cast aluminum Bell boxes and shall be furnished
2 with S/S cover plates. Provide NEMA #4 water-proof boxes for wet areas.
3

4 **2.3 PLUMBING AND ELECTRICAL REQUIREMENTS**

- 5
6 A. Prewiring of electrical items to junction boxes or circuit breaker panels shall comply with UL, NEMA, NEC and prevailing
7 codes.
8
9 B. Faucets, sprays and mixing valves shall be T&S Brass & Bronze or comparable Chicago Faucet item. Faucet brand shall be
10 consistent throughout this project.
11

12 **PART 3 - EXECUTION**

13
14 **3.1 GENERAL**

- 15
16 A. All plumbing, electrical and mechanical components scheduled to be installed by separate contractor shall be tagged with
17 item numbers and given to that contractor.
18
19 B. Furnish to separate contractors at a sufficiently early date all floor troughs or other equipment and accessories to be
20 installed by that contractor.
21
22 C. Any existing equipment scheduled to be re-used or disposed of shall be disconnected by separate contractors. Relocate
23 and install those items according to instructions given for new equipment and in accordance with instructions given in the
24 Equipment Schedule.
25
26 D. Where dimensions are shown on drawings they shall be adhered to, subject to field dimensions by LEC and approval by
27 the Architect.
28
29 E. Remove crating and rubbish on a daily basis. Verify with CM on availability of on-site trash disposal area.
30
31 F. Protect all new and relocated laundry equipment from damage until final acceptance by the Owner.
32
33 G. Verify all conditions at the building, particularly door openings and passageways to avoid delivering items too large for
34 entry. Coordinate with the CM access to insure delivery of equipment to the required areas. Coordination shall include,
35 but not be limited to, early delivery, hoisting, window removal and/or delay of wall construction. All special equipment,
36 handling charges, window removal, etc. shall be paid for by the LEC.
37

38 **3.2 INSTALLATION**

- 39
40 A. Provide a competent foreman to direct the Work and to advise other separate contractors regarding proper installation
41 and connection of the equipment, per manufacturer's instructions.
42
43 B. Assist separate contractors in temporary relocation of equipment as required to make connections. Instruct separate
44 contractors on equipment manufacturer's connection details.
45
46 C. Set and level all non-mobile equipment to the correct height and anchor where indicated and/or required for secure
47 installation per manufacturer instructions. Use concealed anchors wherever possible. Anchors are to be noncorrosive
48 and of adequate size for the Work. Align adjoining pieces of equipment for flush fit wherever applicable.
49
50 D. Cut holes in laundry equipment for fixtures, conduit, receptacles, cords, pipes and ducts.
51
52 E. Patch and trim all openings, seams and cracks in a neat manner and in conformance with prevailing health and building
53 codes.
54
55 F. All permanent equipment installed against walls, floors, ceilings or other equipment shall be sealed to same using clear

1 silicone sealant. Sealant is to be applied smoothly and in a concave shape, forming an air-tight and waterproof barrier.

2
3 **3.3 ELECTRICAL REQUIREMENTS**
4

- 5 A. Comply with standards of NEC, UL and NEMA or with the prevailing code authority.
6
7 B. Exposed junction boxes for switches and receptacles shall be S/S or cast aluminum Bell boxes and shall be furnished with
8 S/S cover plates when such boxes are specified as part of custom fabricated equipment. Provide NEMA #4 water-proof
9 boxes for wet areas.
10
11 C. Provide attached cordsets where cords are indicated on the laundry Electrical Schedule. Cordsets are to be neoprene, of
12 adequate length. EC to match receptacle to cap.
13

14 **3.4 PLUMBING REQUIREMENTS**
15

- 16 A. All plumbing work shall be in accordance with prevailing codes and regulations.
17
18 B. Furnish to the PC for installation all control valves, valve-type wastes, vacuum breakers, pressure reducing valves, check
19 valves, solenoid valves, water filters, etc., as indicated in the Contract Documents.
20

21 **3.5 MECHANICAL REQUIREMENTS**
22

- 23 A. All mechanical work shall be in accordance with prevailing codes and regulations.
24
25 B. Furnish gas pressure regulators for all laundry equipment requiring pressures below 14" W.C.
26

27 **3.6 CLEANING**
28

- 29 A. When installation is complete, remove all tape from the equipment and all debris from the work areas and leave the
30 facility broom clean. Equipment shall be left with scratches buffed out and any painted surface damage touched-up.
31 Replace work that cannot be properly restored. Equipment is to be left free of dirt and reasonably free of dust. Final
32 cleaning and sanitizing is to be done by Owner.
33

34 **3.7 TESTING**
35

- 36 A. Equipment shall be started and tested by factory-authorized service agencies.
37
38 B. Lubricate, start-up, test and adjust equipment prior to Owner's inspection and demonstration. Repair or replace
39 equipment that is not fully operational or is noisy or vibrating. When cleaning and testing and adjusting is complete,
40 notify Architect in writing.
41

42 **3.8 DEMONSTRATION**
43

- 44 A. When cleaning, testing and adjusting have been completed and operation and maintenance manuals approved, arrange
45 for demonstration times at Owner's convenience but during normal working hours. Demonstrations shall be done by
46 competent, trained personnel, thoroughly familiar with the operation, techniques of usage, capacities and maintenance
47 of the equipment.
48
49 B. The LEC contract representative for this Project shall be present at all equipment demonstrations.
50
51 C. Furnish all warranty cards and advise Owner to complete and file the registrations. Demonstration and instruction may
52 take up to two full days.
53

54 **3.9 MAINTENANCE SCHEDULE**
55

- 1 A. Provide operation and service inspections every ninety (90 days) during the warranty period. Final inspection shall be
2 thirty (30) days before warranty expiration. Any service or repair requirements shall be performed before the end of the
3 warranty period.
4
- 5 B. Copies of all warranty service calls and inspection reports shall be mailed to the owner and building operations engineer.
6
- 7 C. The Owner may call an outside company at the expense of the Laundry Equipment Contractor, if the Laundry Equipment
8 Contractor does not arrive within four (4) hours of the time called in response to an emergency call.
9

10 **PART 4 - ITEM SPECIFICATIONS**

11
12 Bartillon Drive Homeless Shelter
13 Madison, Wisconsin
14

15 NOTE 1: Rough-in drawings for this project have been prepared by Stewart Design Associates, Inc. It shall be the responsibility
16 of the Laundry Equipment Contractor (LEC) to verify all dimensions, plumbing and electrical services and prevailing codes as they
17 relate to this Project and to show any required changes on the documents submitted for approval.
18

19 NOTE 2: Where model numbers or multiple names of equipment manufacturers are given in this Specification the equipment
20 manufactured by the first-named manufacturer shall provide the design, material and performance standards upon which
21 acceptance of the equipment shall be based. Equipment substitution requests must be submitted two weeks prior to bid
22 opening, on a fully completed request form – Advancement of Construction Technology, Substitution Request Form.
23

24 NOTE 3: Approved fabricators of custom fabricated S/S equipment for this Project are:

25
26 BEST-WAY FABRICATING, INC.
27 603 19th Avenue NE
28 P.O. Box 187
29 St. Joseph, MN 56374
30 320-363-4600 (Phone)
31 1-800-896-5564
32

33 NATIONWIDE FABRICATION, INC.
34 5311 Niagara St.
35 Commerce City, CO 80022
36 303-853-0107 (Phone)
37 303-853-0114 (Fax)
38

39 INSTITUTIONAL EQUIPMENT, INC.
40 704 Veterans Parkway, Unit B
41 Bolingbrook, IL 60440-5094
42 630-771-0990 (Phone)
43 630-771-0994 (Fax)
44

45 TWO RIVERS ENTERPRISES
46 490 River Street West
47 Holding, MN 56340
48 (320) 746-3156 (phone)
49 (320) 746-3158 (fax)
50

51 SAVANNAH
52 735 Florence Road
53 Savannah, TN 38372
54 (800) 447-4693 (Phone)
55 (731) 925-2840 (fax)

- 1
2
3 L1 SOAK SINKS
4 One required
5 E.L. Mustee or approved equal model;
6 One model 26F two compartment laundry sink complete with the following:
7 A. One T&S Model B-1123 faucet with B-WH4 wrist handles.
8 B. 1 ½" rubber stoppers and overflow tubes.
9 C. Above sink provide two 3'-0" long x 12" deep wall mounted 16 ga. S/S overselves. Mount shelves at 52" and 64"
10 AFF.
11
12 L2 SOILED LAUNDRY SHELVING
13 One lot required
14 InterMetro, Olympic or Cambro approved equal;
15 Provide the following:
16 A. Ten each 24 48BR shelves.
17 B. Eight each 64UP posts.
18 C. Four each 5M casters.
19 D. Four each 5MB casters.
20
21 L3 SCALE
22 One required
23 Newhouse or approved equal model;
24 One **model S53 portable laundry scale**, with hand rails and poly basket.
25
26 L4 EYE WASH
27 Provided by PC.
28
29 L5 HAND SINK
30 One required
31 Fabricated or approved equal;
32 One wall-mounted hand sink, 16 ga. S/S, with 14" x 12" x 8" deep bowl with integral side splashes, Z-bracket, 2.2GPM, S/S
33 three-sided apron and the following accessories:
34 A. T&S Model EC3101-HG, hydro-generator splash-mounted hands free faucet with gooseneck swivel spout and aerator.
35 Provide a single hole in the backsplash for the faucet mounting. Include solenoid valve, mixing valve, control module
36 and two braided hoses.
37 B. Chrome P-trap.
38 C. 1 1/2" S/S basket strainer.
39
40 L6 FLOOR TROUGH
41 One required
42 H-M COMPANY
43 Above floor polypropylene floor trough with lint filter and grate. Bottom discharge. 10'-0"L X 18"W X 12"D.
44
45 L7 HOSE BIBB
46 Provided by PC.
47
48 L8 WASHER – 20 POUND
49 One required
50 Continental
51 One Model EH020 soft mount washer, complete with the following:
52 A. Intelligent Control programmable microprocessor controls.
53 B. Automatic flushing and connections for 4 external supply lines and control signals for 4 external supplies.
54 C. 4.4 cubic foot cylinder.
55 D. 8" steel pedestal.

- 1
2 L9 WASHER - 60 POUND
3 Future item.
4
5 L10 WASHER – 60 POUND
6 One required
7 Continental
8 One Model EH060 soft mount washer, complete with the following:
9 A. Intelligent Control programmable microprocessor controls.
10 B. Automatic flushing and connections for 4 external supply lines and control signals for 4 external supplies.
11 C. 8.4 cubic foot cylinder.
12 D. 6” steel pedestal.
13
14 L11 DRYER - 30 POUND
15 One required
16 Continental
17 One Model CG25-35 gas dryer, complete with the following:
18 A. 12.3 cylinder volume.
19 B. Microprocessor touchpad controls with moisture sensing technology.
20 C. ISS Fire Sensing and Extinguishing system.
21
22 L12 DRYER – 75 POUND
23 One required
24 Continental
25 One Model CG75-85 gas dryer, complete with the following:
26 A. 18.6 cylinder volume.
27 B. Microprocessor touchpad controls with moisture sensing technology.
28 C. Reversing cylinder and three phase motors.
29 D. ISS Fire Sensing and Extinguishing system.
30
31 L13 DRYER – 75 POUND
32 Future item.
33
34 L14 FOLDING TABLES
35 Two Required
36 Fabricate
37 A. Full undershelf, sectional and removable.
38 B. Provide four Colson #2.05267.95.MTG46.BRK5 TotalLock swivel stem casters or Jarvis equal.
39 The caster locking device shall lock both the swivel action and the caster rotation with a single thermoplastic
40 brake lever.
41
42 L15 CLEAN LAUNDRY SHELVING
43 One lot required
44 InterMetro, Olympic or Cambro approved equal;
45 Provide the following:
46 A. Ten each 24 48BR shelves.
47 B. Eight each 64UP posts.
48 C. Four each 5M casters.
49 D. Four each 5MB casters.
50
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- END OF SECTION

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**SECTION 11 40 00
FOODSERVICE EQUIPMENT**

PART ONE - GENERAL

DESCRIPTION

The work shall be in accordance with all Contract Documents and shall include miscellaneous work and material which is reasonably inferred and necessary for completion. Make minor changes in equipment location as directed by the Owner or his representative.

Provide a knowledgeable and competent jobsite foreman to coordinate with applicable trades for all plumbing, electrical and HVAC rough-ins, wall openings, floor depressions, floor pitches, and equipment curbs and pads.

Verify available utility services and provide equipment accordingly. Verify rough-in locations and advise Owner's representative of any discrepancies prior to pouring of floors or closing of walls. Verify all plumbing, electrical and HVAC requirements of new, existing and purveyor-furnished foodservice equipment. Verify all field dimensions and existing equipment dimensions.

RELATED WORK BY OTHER CONTRACTORS

GENERAL CONTRACTOR (GC)

Provide transit-level recesses for walk-in cooler/freezer floors and other depressions as indicated on the Drawings. Provide quarry tile or other flooring material and base inside and outside walk-in coolers and freezers as shown on the Section 11 40 00 Drawings. Provide slab insulation, concrete wearing floors and setting beds.

Provide core drilling and sleeves in floors, wall sleeves, concrete equipment pads and roof curbs with pitch pockets for refrigeration system components.

Provide concealed wall backing of size and type and at locations indicated on shop drawings submitted by the Food Service Contractor (FSC).

Install floor troughs and floor pans furnished by FSC.

PLUMBING CONTRACTOR (PC)

Provide rough-in and final connections of all plumbing services. Flush all lines of foreign matter before connecting fixtures.

Provide all water supply and drain lines, drain fittings, floor drains, valves, traps, tailpieces and pressure reducing valves, back flow prevention valves; looped gas supply lines, gas pressure reducing and regulating valves for pressure above 14" W.C., gas shut-off valves (except for gas fire/fuel shut-off solenoid valves); grease traps; and PVC conduit for refrigeration lines, unless indicated in the Plumbing Schedule as furnished by the FSC.

Install all faucets, spray units, lever drains, vacuum breakers, check valves, flow control valves, water inlets, traps, filters, strainers, PRV valves, T/P gauges, gas valves, gas hoses, gas pressure regulators, etc., furnished by the FSC. Exposed piping and fixtures shall not show tool marks. Horizontal piping shall be a minimum of 6" AFF.

Provide walk-in cooler and freezer copper condensate line piping, trapped outside the cold rooms and installed per prevailing codes.

Make connections between sections of modular equipment such as exhaust hoods, and warewashing machines.

ELECTRICAL CONTRACTOR (EC)

1 Provide rough-in and final connections of all electrical services. Install electrical devices furnished by FSC and indicated
2 on Electrical Schedule. Wet areas such as sinks, disposers or dishwashers shall be wired in Sealtite Type EF conduit or
3 equal, thru water-proof boxes.
4

5 Provide receptacles (GFI), conduit, contactors, controllers, switches, disconnects, starters, etc., unless indicated in the
6 Electrical Schedule as furnished by the FSC.
7

8 Where shunt trips are indicated on the Electrical Schedule provide shunt trips and/or contactors with 120V coils with
9 contact ratings matching the electrical appliance or device. Wire from the micro switch relay on the fire control system
10 head to the contactors/shunt trips.
11

12 Make electrical connections between sections of modular equipment such as utility distribution systems, exhaust hoods,
13 refrigeration systems or walk-in coolers and freezers. Exposed conduit for walk-in cooler/freezer lighting will not be
14 permitted.
15

16 HVAC CONTRACTOR (HC)

17
18 Provide rough-in and final connections of all HVAC services.
19

20 Provide ducts, fans, dampers, starters, etc., necessary for operation of grease extracting exhaust hoods, condensate
21 hoods, approved fire barrier material when exhaust hood is located closer than 18" to combustible material or structure
22 and ventilator stacks.
23

24 QUALITY ASSURANCE

25
26 Comply with all federal, state and local laws and regulations governing materials, installation, health, safety, fire, HVAC
27 and electrical requirements within the applicable jurisdiction.
28

29 Comply with Standards of ADA, AGA, ASHRAE, ASME, ANSI, NEMA, NEC, NFPA #17A, 54, 70, and 96, NSF, OSHA and UL.
30

31 All principal items of equipment shall bear the NSF seal.
32

33 Use UL Listed electrical components and include UL labels.
34

35 When the Contract Documents call for higher standards or larger sizes than the regulations, the Contract Documents shall
36 govern. When the regulations require higher standards or larger sizes than the Contract Documents, the regulations shall
37 govern. Rulings and interpretations of the enforcing agencies shall be considered a part of the regulations. No additional
38 amounts shall be paid for such compliance.
39

40 If, because of jurisdictional trade agreements or other conditions, any work specified in the Contract Documents must be
41 done by others, sublet such work only to those who are qualified to do such work or make other arrangements at the
42 expense of the FSC, subject to approval by the Architect.
43

44 GUARANTEE

45
46 Equipment provided under this Contract shall be guaranteed for parts and labor for a period of one (1) calendar year from
47 date of acceptance by the Owner as determined by the Owner and Architect. Any parts requiring replacement due to
48 defective material or workmanship during this period shall be promptly replaced with new parts and installed at no cost
49 to Owner.
50

51 Equipment shall be serviced within a reasonable time by a competent and factory-trained local service agency. When an
52 equipment breakdown occurs, service shall be performed within 24 hours of the request. If the necessary repairs or
53 replacements are not made promptly, the Owner may have the necessary repairs and replacements made and charge
54 the costs to the FSC.
55

56 Condensing units shall be further warranted on a pro rata basis for an additional four years, exclusive of labor.
57 Refrigeration warranties shall include replacement of refrigerant caused by a fault or leak in the system.

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SUBMITTALS

Submit shop and rough-in drawings, schedules and three buy-out brochure manuals within 30 days of award of contract or as required by the Architect. Submit each page for review in quantities required by the Architect.

Electronic shop drawings and rough-in drawings, when required by the Architect shall be in AutoCAD or AutoCAD compatible format and buy-out books shall be in Word or PDF format. Architect or GC shall forward to the Foodservice Consultant all buy-out manuals and all drawings for review. Drawings shall be sent rolled up and in a tube. Buy-out manuals shall be assembled in hard-cover three-ring binders with one electronic copy. Corrected brochure manuals and drawings will be returned by the Foodservice Consultant for revisions by the FSC. Repeat until all corrections are satisfactorily made. FSC shall be responsible for any utility costs associated with deviation from Foodservice drawings and specifications.

When drawings are approved, submit assembled sets of prints in quantity required by the Architect.

When manuals are approved submit assembled brochures in quantity required by the Architect. Provide a numbered cover sheet for each Item that includes a copy of the Specification for that Item. Manuals are to indicate accessories and components used with each Item. Cross out models or accessories shown on catalog sheets but not required by the Specifications.

Drawings shall include:

Itemized plumbing, electrical and HVAC requirement schedules showing quantities, all required services, sizes and all accessories furnished by the FSC for installation by the applicable trades.

Plumbing, electrical and HVAC rough-in plans in 1/4" scale. Rough-in Drawings included with the Contract Documents may be used only with the written permission of the Foodservice Consultant. When such drawings are used it shall be the responsibility of the FSC to verify all dimensions and plumbing, electrical and HVAC services and prevailing codes as they relate to this Project and to show any required changes on the documents submitted for approval. Rough-in plans may be combined on one sheet only with permission of the Foodservice Consultant. Plans are to show location, elevation, size and type of water supplies, drains, gas lines, floor drains, site drains, electrical supplies, outlets, switches, etc. Rough-in dimensions shall be located from readily identifiable column centers and finished walls as drawn by the Architect. Include on each drawing page a legend of commonly used symbols and abbreviations.

Floor recesses, trenches, refrigeration lines, refrigeration conduit, concealed wall blocking, pass-thru openings, etc., in 1/4" to 3/4" scale.

Owner's existing equipment, Owner-furnished equipment, future equipment and purveyor-furnished equipment such as beverage machines, when indicated in the Contract Documents.

Plans, elevations, sections and details for all custom fabricated items, exhaust hoods, walk-in coolers and freezers, etc.

Submit shop drawings showing plans, elevations and details for all custom fabricated items in minimum 3/4" scale. Detailed sections shall be 1 1/2" scale or larger. Shop drawing paper size shall be a minimum of 24" x 36".

When approved drawings and buy-out brochures are received by the Owner and Architect, fabrication may begin. The approvals shall not relieve the FSC of responsibility for conformance with the Contract Documents unless written approval of change is obtained from the Owner or the Owner's representative.

Prior to demonstration and final inspection submit three copies of operation and maintenance manuals to Architect or GC for approval. Manuals shall be in hard cover three-ring binders, electronic copy in Word or PDF format and shall include replacement parts lists and a typewritten sheet listing names, addresses and phone numbers of all service agencies to be involved, with reference to the names and item numbers of the pieces of equipment each services. Provide a typewritten index sheet showing, in numerical order, the item numbers and corresponding model and serial number

1 for each piece of equipment. Provide a cover sheet listing the name, address and phone number of the Architect, FSC
2 and the Food Service Consultant.

3
4 Should the contract for foodservice equipment be awarded after the plumbing, electrical and HVAC services have been
5 roughed-in, verify the locations of all such services, sleeves, depressions, etc., and incorporate them in the drawings. If
6 the inspection reveals that the existing conditions seriously interfere with the execution of the Work, report these
7 conditions to the Architect and await instructions before proceeding with that portion of the drawings.

8
9 **PRODUCT STORAGE, DELIVERY AND HANDLING**

10
11 All shipping, storage and delivery costs for equipment furnished by the FSC shall accrue to the FSC.

12
13 Do not deliver equipment until authorized by the GC. Verify storage areas with the GC prior to delivery. Verify delivery
14 route and building access prior to fabrication or installation.

15
16 Equipment shall be wrapped and crated at the factory and shall be delivered in undamaged condition. FSC shall be
17 responsible for loss or damage to equipment until final inspection and acceptance by the Owner. Store all equipment
18 and materials in such a manner as to prevent damage due to moisture, foreign material and impact.

19
20
21 **PART TWO - PRODUCTS**

22
23 **GENERAL**

24
25 All equipment shall be manufacturer's latest model. An item of equipment specified by model number shall include all
26 accessories the manufacturer includes as standard with the equipment as well as specified optional accessories.

27
28 The manufacturing facilities used for custom fabricated equipment shall at all times be accessible for the Architect and
29 Consultant to inspect the materials and general construction and progress of the Work.

30
31 **CUSTOM FABRICATION**

32
33 All custom fabricated equipment as described in the Item Specifications shall be of uniform design and finish and shall be
34 fabricated by one manufacturer.

35
36 Stainless steel shall be 18-8 Type 304, ASTM Specification A167, #4 finish, ASTM Specification A480. Sheets shall be free
37 of warps, buckles, pits and scratches. Galvanized steel shall meet ASTM Standard A446. All edges, corners and welds shall
38 be ground and polished smooth. Unless specified otherwise the following metal gauges shall be used:

39 10 gauge: Gusset plates.

40 12 gauge: Hardware reinforcement, channels.

41 14 gauge: Table tops, sinks, splash shields, drainboards, slanting rackshelves and shelf brackets.

42 16 gauge: Undershelves, overshelves, wall shelves, drawer fronts and access panels, double pan
43 doors.

44 18 gauge: Cabinet bodies, drawer pans, skirts, closure panels, trim strips, exhaust hoods.

45
46 Standard table top edges shall be turned down square 1 1/4" with 1/4" turn back angled downward 15 degrees.

47
48 Reinforce tops with welded galvanized or S/S U-channels, closed welded hat channels or painted angle iron, lengthwise
49 and with crossbraces 30" O.C. minimum and at each pair of legs. Intersections of channels shall be fully welded. Tack
50 welding of channel intersections will not be accepted.

51
52 Standard backsplashes shall be 10" high with 2" return to wall on 45 degree and then down 1/2" at rear. Ends shall be
53 closed and welded. Cove the intersections of all back and endsplashes and raised rolled rims on tables, dishtables and
54 drainboards a minimum of 3/4", horizontally and vertically.

55
56 Fasten tops to bases with studs welded to underside and capped with locking chrome acorn nuts. No exposed bolt or
57 stud threads will be permitted on fabricated equipment.

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Enclosed and semi-enclosed cabinet bases shall have flush fully welded mullion facings. Vertical partition dividers shall have #4 finish on both sides. Concealed partitions to be galvanized. Sections and framework behind cabinet doors shall be S/S.

Pipe stands and frames shall be fabricated of 1 5/8" O.D. 16 ga. Type 304 S/S tubing with continuously fillet welded cross bracing. Welds shall be ground and polished smooth. Legs to have S/S adjustable feet and S/S enclosed gussets welded to galvanized or S/S channel. Gussets shall be Component Hardware #A18-0206 or equal. Adjustable flanged feet are to be S/S, anchored with S/S fasteners.

Doors shall be of welded double pan construction, 3/4" thick, with sound deadening core and channel bracing. Equip hinged doors with Component Hardware #P63-1012 recessed S/S handles and #M21-2580 mechanical catches with spring action nylon rollers. Hinged doors are to have heavy duty S/S lift-off hinges and are to be mounted flush with cabinet body.

Equip sliding doors with Component Hardware #62-1010 recessed handles. Sliding doors shall be hung from 14 ga. S/S overhead tracks and shall have bottom guides and nylon rollers. Provide limit device to prevent sliding doors from telescoping.

Drawers shall be provided with Component Hardware Series S52 heavy duty slides, 200# load capacity per pair. Install on angle of 1/2" in 12" to provide self-closing operation. Mount slides to an 18 ga. S/S channel-type three-sided housing having an open bottom with two welded S/S channel cross braces. Drawer housings are not to be considered as crossbracing for table tops. Drawer front shall be of 16 ga. S/S double pan construction with fiberboard insulation between. Each drawer shall have continuous top pull as shown on the Drawings. Drawer pan holder shall be 16 ga. S/S and shall be tack welded to back of drawer front and sealed with silicone. Drawer pans shall be stamped 18 ga. S/S, 20" x 20" x 5" or other sizes as specified and shall be easily removable without the use of tools. Include drawer stops and Component Hardware #Q20-2081 rubber cushion bumpers.

Undershelves on open base tables shall be fully welded or removable, as specified. Welded type shall have edges turned down to match table tops. Undershelves of 20" or more in width shall be reinforced with welded S/S or galvanized U-channels or angles, lengthwise and with crossbraces 30" O.C. minimum and at each pair of legs. Intersections of bracing shall be welded as described for table top bracing. Removable shelves shall be sectional with no section larger than 27"x 33" and with edges rolled to conform to the crossbracing and stretchers. Grind and polish all edges and corners of removable shelves.

Undershelves in cabinet bodies shall be 16 ga. S/S, formed with the back and ends turned up 1 1/2", coved, welded and sealed to the cabinet body, with front edge and reinforcement as described for open base tables.

Table overshelves shall have edges matching that described for table tops. Supports shall be 1 1/4" diameter S/S tubing with nuts welded in bottom of tube and bolted from below. Provide channel under table surface where bolts penetrate. Table overshelves over 12" wide shall have enclosed S/S longitudinal inverted hat channel bracing. Cantilever supports (flags) shall be 14 ga. S/S, welded. Standards passing through an angled backsplash shall be thru close-fitting oval holes. Bolt cantilevered standards to heavy gauge flanges welded to the underside of the table. Standards for splash-mounted overshelves shall be not more than 60" O.C.

Wall-mounted shelves shall be similar in construction to table overshelves, supported on 14 ga. S/S brackets.

Sinks shall be 14 ga. S/S with intersections and corners coved a minimum of 3/4". No soldered filleted corners will be accepted. Sinks with two or more compartments shall have fully welded double wall partitions. No evidence of welding shall appear. Trim bands will not be permitted. Provide an 18 ga. S/S apron covering the front of multiple bowl sinks. Crease bottom of sink four ways to recessed drain cup. Backsplash shall be 10" high, of same description as table splashes. Grain of splash shall match grain of rear of bowls. Sink legs, rails, gussets, feet, underbracing and shelves shall be to same specification as tables.

Provide brackets for rotary drain handles, attached with welded studs and acorn nuts. Brackets for disposer control switches, control panels and mixing valves shall be fully welded to sink or table or shall be welded to a full depth U-channel which is attached to the sink or table by not less than six spot-welded studs.

1
2 Drainboards shall be 14 gauge S/S, integrally welded with straight rolled rim at front. Pitch drainboards toward sinks.
3
4 Hardware and buy-out accessories shall be identified on the shop drawings on a bill of material, subject to approval.
5
6 Prewiring of electrical items to junction boxes or circuit breaker panels shall comply with UL, NEMA, NEC and prevailing
7 codes.
8
9 Where U.L. Listed equipment assemblies with electrical circuit breaker panels are specified for custom fabricated
10 equipment, the equipment shall be fabricated in a U.L. Listed shop.
11
12 Field wiring and U.L. field certification shall not be acceptable. Identify all circuits by typewritten index. Provide all panel
13 spaces with breakers or dummies.
14
15 Internal wiring specified for custom fabricated equipment shall be identified with tags indicating item number and
16 electrical characteristics. Furnish wiring diagrams. Wiring shall run in rigid conduit, zinc coated where concealed and
17 chrome or S/S where exposed. Wire wet areas in Sealtite Type EF conduit or equal. Provide conduit raceways where
18 possible. NEMA #4 standards shall apply to all splash areas. Final connections by EC.
19
20 Exposed junction boxes for switches and receptacles shall be S/S or cast aluminum Bell boxes and shall be furnished with
21 S/S cover plates. Provide NEMA #4 water-proof boxes for wet areas.
22
23 REFRIGERATION SYSTEMS
24
25 Refrigeration system condensing units shall be factory assembled and spring mounted on a rigid painted steel base. All
26 systems shall have time clocks or electronic master controls, adjustable low pressure control, adjustable defrost
27 termination control, permanently lubricated fan motors, internal overload protection, lubrication system, sight glass,
28 vibration eliminators on suction lines of 5/8" or larger, high-low pressure control with pressure hose connections, suction
29 filter, dryer, service isolation valves, heat exchanger, TX valve, solenoid valve and other accessories required for proper
30 operation. Low temperature systems shall include an accumulator.
31
32 Evaporator coils shall be mounted tight to ceiling of walk-in box per manufacturer's directions. Air throw to be parallel
33 to ceiling. Coils shall be hung from non-ferrous rods extending through ceiling of box and secured with nuts and washers.
34 All coils are to be properly matched to condensing units and refrigeration function. Freezer coils to have automatic
35 electric defrost. All cold systems shall meet or exceed all national and local energy codes/requirements.
36
37 COLD STORAGE ROOMS
38
39 Wall and ceiling panels shall be in maximum standard width. Corner panels shall be an exact 90degree angle to ensure
40 proper alignment and strength. Panels shall consist of foamed-in-place urethane between interior and exterior metal
41 surfaces which have been precision die formed and with edges turned 90 degree into the panel. Edges shall be gasketed
42 with double-vinyl gaskets and fitted with foamed-in cam locks. All cold storage rooms shall meet or exceed all national
43 and local energy codes/requirements. Ceiling panels are not permitted to be anchored to the building structure for ceiling
44 support. Internal support beams when required are to be engineered by the manufacture, provided and shown in the
45 walk-in shop drawings.
46
47 Panels shall be 4" thick, completely filled with rigid foamed-in-place urethane having an R-factor of 34. Insulation shall
48 have a 97% closed cell structure with an average in-place density of 2.4 lbs. per cu. ft. and a compression strength at yield
49 point of 30 PSI.
50
51 Fabrication and finish of partition walls shall be the same as the perimeter walls and shall lock into wall, ceiling and floor
52 panels with Posi-Lock assemblies. Tongue and groove foam fabrication shall provide the thermal break between cooler
53 and freezer compartments.
54
55 Manufactured floor shall be fabricated similar to others panels, designed to readily withstand uniformly distributed loads
56 of 700 lbs. per sq. ft. General Contractor floor shall be installed in a 7" deep smooth and level recessed area provided by
57 the GC. Provide a 6 mil polyethylene vapor barrier below the insulated floor. GC to provide two 2" thick layers of extruded

1 compressed polyurethane rigid foam board insulation with staggered joints in floor depression, over vapor barrier. GC
2 to install after walls are in place. Concrete substrate topping and wearing surface to be provided and installed by GC. GC
3 shall provide a level cooler/freezer floor with 6" high S/S covered base on the interior and exposed exterior of the cold
4 rooms.

5
6 Fire hazard classification shall be in accordance with ASTM E-84 (UL723) and shall have a flame spread rating of 25 or less
7 with a UL label. (This rating is not intended to reflect hazards presented by this or any other material under actual fire
8 conditions).

9
10 Entrance doors shall have a net opening of 36" x 78" or width as shown on the Drawings and shall be flush-type with
11 interior and exterior finish matching that specified for the wall panels. Doors and door panels shall be UL Listed and
12 equipped with the following:

13
14 Magnetic gasket, Posi-Seal door closure and latch. Provide inside safety release to prevent entrapment of
15 personnel within the box.

16
17 Self-closing mechanism with three strap-type camlift hinges and with NSF approved double sweep gaskets.

18
19 Door jamb of extruded aluminum with a thermal break. An isolated, low wattage heater strip covered by
20 magnetically attracted S/S shall be fitted onto jamb. Strip shall provide perfect sealing of magnetic gasket and
21 prevent frost and condensation build-up.

22
23 All concealed wiring in wall panels shall be in rigid conduit. Concealed wiring shall be standard on each entrance
24 door section. Switch to control light fixtures as shown on the Drawings. Interior lights must produce a minimum
25 of 40 lumens per watt, and use a timing device which turns off lights within 15 minutes of a persons exit.

26
27 12 gauge S/S threshold with non-skid stripping. Aluminum treadplate of 3/16" thickness is acceptable for the
28 threshold. Heater wire shall continue beneath the threshold.

29
30 Solid-state digital thermometer to indicate inside temperature.

31
32 Air curtain or strip curtain with 6" wide strips as specified.

33
34 Factory-installed 16 ga. S/S kick plates on each side up to a height of 36".

35
36 Provide electrically heated pressure relief vent for freezer room.

37
38 **ARCHITECTURAL WOODWORK**

39
40 Perform architectural woodwork in accordance with "Architectural Woodwork Quality Standards" published by the
41 Architectural Woodwork Institute (AWI). Fabricator shall have a minimum of 5 years' experience in fabricating
42 architectural woodwork items similar in type and quality to those required for this project.

43
44 Plastic laminate to be PF grade .042 TUF SURF 2 WilsonArt, Formica or approved equal high pressure laminate.
45 Laminate to be selected by Architect. Use Urac 185 adhesive or equal, applied under heated pressure over
46 close grained 3/4" exterior grade birch plywood. In accordance with AWI 1600A-G-1, use horizontal grade on
47 all exposed surfaces and vertical grade on semi-exposed surfaces and interior cabinet walls. Provide backer
48 sheet on concealed surfaces, including underside of top. Paint all cut-outs.

49
50 Top sheet shall be placed on and over finished edge. Ease exposed edge or overlap sheet. Use largest sheets
51 possible in order to hold seams to a minimum.

52
53 Drawer sides, back and front shall be assembled with dado joints, glued and screwed. Drawer bottoms shall be
54 dadoed into sides, back and front and glued in place. Doors are to be flush or flush overlay type as specified,
55 with self-closing Grass #3803 hinges and S/S wire pulls.

56
57 Drawer slides are to be Knap & Vogt, or approved equal, full extension ball bearing type.

- 1
- 2 Seams and field joints shall be machined and installed for close fit and complete evenness. Field joints shall use
- 3 splines.
- 4
- 5 Cove backsplashes a minimum of 1/4". Endsplashes may have square intersections with table tops unless
- 6 otherwise specified.
- 7
- 8 Adjustable shelves shall be laminated with horizontal grade laminate on six sides and shall be provided with
- 9 heavy duty metal pilasters with snap-in shelf supports.
- 10
- 11 Locks are to be 5-pin tumbler locks, keyed alike.
- 12
- 13 All condensing units mounted in cabinet bases shall be provided with adequate space for service, clear access
- 14 for condensing unit removal and adequate ventilation to ensure that the unit does not operate at temperatures
- 15 above the manufacturer's requirements.
- 16

17 EQUIPMENT SCHEDULE

18

19 BARTILLON HOMELESS SHELTER

20 MADISON, WISCONSIN.

21

22 NOTE 1: Rough-in drawings for this project have been prepared by Stewart Design Associates, Inc. It shall be the

23 responsibility of the Food Service Contractor (FSC) to verify all dimensions, plumbing and electrical services and prevailing

24 codes as they relate to this Project and to show any required changes on the documents submitted for approval.

25

26 NOTE 2: Where model numbers or multiple names of equipment manufacturers are given in this Specification the

27 equipment manufactured by the first-named manufacturer shall provide the design, material and performance standards

28 upon which acceptance of the equipment shall be based. The base bid shall include the prime equipment specified with

29 listed manufacturer, model, size and utility requirements, capabilities as well as options and accessories. FSC must submit

30 base bid based solely on these specified items as to establish an accurate comparison amongst bidders. Complete

31 itemized pricing with manufacturer and model number as a part of bid proposal submission.

32

33 Upon approval of the Architect/Owner, supplemental to the bid, based upon the prime equipment as specified, the FSC

34 may separately propose substitutions (alternate equipment other than specified). The FSC shall submit complete

35 illustrations, specifications, capacities and utilities as well as operational data for all proposed alternates along with the

36 cost savings that the proposed substitution will provide. It is the FSC's responsibility to prove that the item or items

37 submitted as substitutions provide the same level of performance and provides equal or greater value than the prime

38 specified item/s. Equipment substitution requests must be submitted two weeks prior to bid opening, on a fully

39 completed request form – Advancement of Construction Technology, Substitution Request Form.

40

41

42 Approved alternate manufactures are listed when available. Please add SYS ID #S115 to each model number as consultant

43 contact reference for manufacturer.

44

45 NOTE 3: Approved fabricators of custom fabricated S/S equipment for this Project are:

46

47 BEST-WAY FABRICATING, INC.

48 603 19th Avenue NE

49 P.O. Box 187

50 St. Joseph, MN 56374

51 320-363-4600 (Phone)

52 1-800-896-5564

53

54 NATIONWIDE FABRICATION, INC.

55 5311 Niagara St.

56 Commerce City, CO 80022

57 303-853-0107 (Phone)

- 1 303-853-0114 (Fax)
2
3 INSTITUTIONAL EQUIPMENT, INC.
4 704 Veterans Parkway, Unit B
5 Bolingbrook, IL 60440-5094
6 630-771-0990 (Phone)
7 630-771-0994 (Fax)
8
9 TWO RIVERS ENTERPRISES
10 490 River Street West
11 Holding, MN 56340
12 (320) 746-3156 (phone)
13 (320) 746-3158 (fax)
14
15 SAVANNAH
16 735 Florence Road
17 Savannah, TN 38372
18 (800) 447-4693 (Phone)
19 (731) 925-2840 (fax)
20
21 ITEM 1 DRY STORAGE SHELVING
22 One lot required
23 InterMetro, Olympic or Cambro approved equal;
24 Provide the following:
25 A. Sixty- five each 2448BR shelves.
26 B. Fifty-two each 74P posts.
27
28 ITEM 2 WALK-IN COOLER
29 One required
30 Bally
31 A. General: One assembly of prefabricated panels in accordance with NSF Standard #7 and Section 11 40 00. Note:
32 This assembly must meet or exceed the Energy and Security act of 2007 and all prevailing codes. Factory certified
33 installation of panels and refrigeration is required. Include a picture of the box, pre-assembled in the factory,
34 prior to shipment. One required Qty. (1) Berner model CLC08-1036AA unheated air curtain with a 24V Basic
35 control package part number 91STR120-BA-M-48. The power supply shall be 120/1/60.
36 The air curtain to be installed directly above the opening to the walk-in cooler and the walk-in cooler control box
37 to be mounted on the outside wall of the cooler on the left hand side of the air curtain. A 15.0 amp 120/1/60
38 dedicated circuit to be run to the control box.
39 B. Sizes: Overall size as shown on the Drawings x app. 9'-2" high, with floor. Box description includes Item 4.
40 C. Metal Finishes:
41 1. Exterior ceiling shall be 26 ga. galvalume steel.
42 2. Interior and exposed exterior walls shall be .040" stucco-embossed aluminum.
43 3. Interior ceiling shall be .040" smooth finished aluminum with baked-on white enamel finish.
44 4. Interior floor shall be 16 ga. S/S with 3M non-skid strips in the aisle. Attach the strips to a
45 completely cleaned floor prior to start-up of the refrigeration system.
46 D. Lighting: Omit lights normally provided with door assemblies. Provide auto sensing LED lights as shown on the
47 Electrical Rough-in Drawing. Lights shall be 48" for wet location. Seal the inside of electrical conduit where it
48 enters a light fixture including all J-boxes and control panels.
49 E. Trim: Trim the box to the walls at exposed vertical junctures with walls and at the space between the top
50 of the box and the finished ceiling using matching aluminum material. Top closure panels shall be installed in
51 channel. No exposed fasteners permitted. Feather the edges of all vertical trim. Furnish and install an extruded
52 bumper rail with vinyl insert on the front and right side of the box, exclusive of the doors.
53 F. Temperature Sensors and Alarms: Modularm Model 75LC recessed in wall panel, as follows:
54 1. 4-digit display with temperature range of -40 degrees to 193 degrees F and MD-1 low voltage
55 motion detector located in box above door.
56 2. Probe cords of sufficient length so that the read-out alarm housings can be mounted on a sidewall,
57 not less than 6' from an entrance door.

- 1 3. Alarms to be completely installed and set to sound on:
2 a. +35 degrees F and +48 degrees F for the cooler
3 b. +15 degrees F for the freezer
4 G. Refrigeration Machines: Provide complete remote glycol cooled refrigeration system, including, one Heatcraft
5 Beacon II system as indicated below, with one remote Smart Controller to control all refrigeration. The Smart
6 Controller shall be mounted on the face of the box. Include temperature monitoring and alarm for each cold
7 room. A microprocessor shall be mounted inside each evaporator coil, replacing the normal temperature
8 controller, expansion valve, time clock, liquid line solenoid and defrost termination clock. The refrigeration
9 system shall also consisting of: consisting of:
10 1. A welded angle iron frame of adequate size and rigidity to securely support the two condensing units
11 described herein. Verify the exact indoor location and method of installation with the GC.
12 2. One Copeland hermetic 2.5 HP closed loop glycol-cooled condensing unit with R-448A refrigerant for the
13 +35 degree cooler.
14 3. One Copeland hermetic 4.0 HP closed loop glycol-cooled condensing unit with R-448A refrigerant for
15 the -10 degree freezer.
16 4. Installed timers, driers, sight glasses, suction line vibration eliminators, low-temp accumulators, for easy
17 service and inspection.
18 5. Furnish and install matching evaporator coils.
19 6. Procedure for completing the system shall follow the requirements of the Section 11 40 00 Specifications.

20
21 **ITEM 3 WALK-IN COOLER SHELVING**
22 One lot required
23 InterMetro, Olympic or Cambro approved equal;
24 Provide the following:
25 A. Sixty-five each 2448NK3 shelves.
26 B. Fifty-two each 74PK3 posts.

27
28 **ITEM 4 WALK-IN FREEZER**
29 Specified as part of Item 2.

30
31 **ITEM 5 WALK-IN FREEZER SHELVING**
32 One lot required
33 InterMetro, Olympic or Cambro approved equal;
34 Provide the following:
35 A. Forty-five each 2448NK3 shelves.
36 B. Thirty-six each 74PK3 posts.

37
38 **ITEM 6 DUNNAGE RACKS**
39 One lot required
40 InterMetro, Olympic or Cambro approved equal;
41 Provide the following:
42 A. Four each 2448BR shelves.
43 B. Seven each 2448NK3 shelves.
44 C. Forty-four each 7P posts.

45
46 **ITEM 7 MOBILE WORKTABLE**
47 One required
48 Fabricate
49 One S/S mobile worktable as shown on the Drawings, with the following accessories:
50 A. Full undershelf.
51 B. Four Colson #22.0567.95 TotalLock swivel stem casters, or Jarvis equal. The caster locking device shall lock both
52 the swivel action and the caster rotation with a single thermoplastic brake lever.
53 C. One Component Hardware Model S90-0020 drawer.

54
55 **ITEM 8 FIRE SUPPRESSION SYSTEM**
56 One required
57 Ansul or approved equal Kidde or Range Guard model;

- 1 One Model R-102 wet chemical fire suppression system with overlapping coverage and a stainless steel mounting
2 enclosure, UL 300 approval rating. Include the following:
- 3 A. Provide hood, duct and surface protection for Items 9, 14 and 15.
 - 4 B. FEC to locate and verify pull station locations with authorized agency.
 - 5 C. Provide mechanical gas shut-off valve. Furnish to PC for installation.
 - 6 D. EC to provide shunt trip relays for all electrical connections below Item 9.
 - 7 E. Provide flexible 5' hose when mobile equipment requires anchored nozzle protection fixed to the equipment.
8 Hose shall provide the ability to roll out the equipment for cleaning.

9
10 **ITEM 9 EXHAUST HOOD**

11 One required

12 Halton

13 One Model KVE Capture Jet exhaust hood, 21'-0" x 6'-0" x 2'-0" high, with S/S grease extractor filters as shown in the
14 drawings. Include heat sensor mounted in hood to meet IMC 507.2.1.1. Filters shall be removable by use of a S/S tool
15 with S/S handle. No fastening devices permitted for the filters. Ventilator shall be all S/S, not less than 18 gauge type
16 304 with #3 finish on exposed surfaces. Unit to include Capture Jet fans with transitions and speed controls. No
17 galvanized metal will be permitted. Provide four U.L. Listed HCL vapor-proof lights, factory pre wired to a single point
18 connection "J" box located in the hood. Hood fan control and light switch location shall be located as shown in the
19 foodservice electrical rough-in drawings. Trim the area between the top of the hood and the finished ceiling with
20 matching S/S. No exposed fasteners permitted. Bottom of hood to be 80" AFF and hood must include S/S trim or off-set
21 18" from combustibles or 3" from limited combustibles. Provision for Item 23.

22
23 NOTE: Approvals shall include NSF seal, U.L. Listing and stamped/sealed engineering and calculations drawings for all
24 exhaust hoods. The drawings must be stamped/sealed by licensed mechanical engineer with-in the state of the
25 installation. The FEC shall provide documents to the GC/Architect for submittal to AHJ for review and approval.

26
27 The ventilator shall conform to the requirements of NFPA 96 and prevailing code. Damper access to be inside of hood.

28
29 Provide testing and balancing of hood by authorized factory trained personnel after all other HVAC systems and cooking
30 equipment are operational. A written report is to be completed by the technician and the Owner and submitted to the
31 Architect with copies to Foodservice Consultant.

32
33 Include MARVEL system with hood mounted infrared cooking activity sensors capable of measuring appliance surface
34 temperatures. Infrared sensor will read appliance surface temperature which will be translated by the specific calculation
35 algorithm for that appliance and will respond proactively to any change in cooking status. Infrared sensor and exhaust
36 collar mounted temperature sensor work in concert on differential temperature reading back to the controller.

37
38 Include S/S utility cabinet for VFDs and VFD(s) to control fan speeds and system shall automatically control the speed of
39 the exhaust fan (and supply if applicable) based upon appliances status, cooking activities and exhaust air temperatures.

40
41 The system can be controlled with either manual On/Off switch, a 24hrs automated schedule with a manual override
42 function, or the hood can be automatically regulated based upon the appliance status.

43
44 The EC shall be responsible for wiring between the supplied control panel and the hood mounted sensors and the VFD's
45 and then to the exhaust /supply fans. Exhaust supply fans specified and provided by MC.

46
47 Include interconnectivity cables between the hoods and associated control panels and room temperature sensor. EC to
48 run and connect required control power and the Controls Systems Contractor or EC to run and wire low voltage cables
49 per drawings.

50
51 NOTE: Approvals shall include NSF seal, U.L. Listing and stamped/sealed engineering and calculations drawings for all
52 exhaust hoods. The drawings must be stamped/sealed by licensed mechanical engineer with-in the state of the
53 installation.

54
55 MARVEL Demand Control Ventilation system shall include grease duct deposition sensor in the plenum of the exhaust
56 hood with the highest grease producing appliances. In addition, appropriate duct sensors as shown in plans. Installation

1 of duct sensors by appropriate trade. Sensor capable of determining deposition levels as determined by NFPA 96
2 guidelines. Operator to be alerted when duct requires cleaning via MARVEL control panel.

3
4 The ventilator shall conform to the requirements of NFPA 96 and prevailing code.

5
6 Duct mounted "temperature only" or systems monitoring temperature along with smoke, will not be permitted.

7
8 MC to provide testing and balancing of hood by authorized factory trained personnel after all other HVAC systems and
9 cooking equipment are operational. A written report is to be completed by the technician and submitted to the Architect
10 with copies to Foodservice Consultant.

11
12 Construction checklist - FEC is responsible for utilizing the construction checklists supplied by the Commissioning
13 Authority under Specification Section 019113, in accordance with the procedures defined for construction checklists.

14 Functioning checklist - FEC is responsible for utilizing functional test procedures supplied by the Commissioning Authority
15 under Specification Section 019113, in accordance with the procedures defined for functional test procedures.

16
17 With-in twenty days after receiving the PO for the exhaust hood, the KEC shall schedule a virtual meeting to include;
18 mechanical contractor, manufacture, manufacture representative and foodservice consultant to coordinate all
19 installation start-up, demonstration and commissioning milestones and requirements.

20
21 **ITEM 10 STAINLESS STEEL WALL COVERING**

22 Lot required

23 Fabricate

24 Provide 18 ga. #4 finish S/S behind the hood. The paneling shall extend from the top of the flooring base material to 18"
25 above the top of the hood and 18" left and right of the hood. Joints between the panels shall be covered with Component
26 Hardware Model J64-1450 H strips. Edges shall be capped with Component Hardware S/S continuous U-clips. Seal the
27 panels with clear silicone. All panels shall be securely attached with a generous amount of clear silicone on the full
28 perimeter of each panel (blind caulking) and on the rear surfaces in order to achieve a tight, flat, bonding of the panels
29 to the walls. Make close-fitting cut-outs for all utilities.

30
31 **ITEM 11 HAND SINKS**

32 Four required

33 Fabricated or approved equal;

34 Four wall-mounted hand sink, 16 ga. S/S, with 14" x 12" x 8" deep bowl with integral side splashes, Z-bracket, 2.2GPM,
35 S/S three-sided apron and the following accessories:

36 A. T&S Model EC3101-HG, hydro-generator splash-mounted hands free faucet with gooseneck swivel spout and
37 aerator. Provide a single hole in the backsplash for the faucet mounting. Include solenoid valve, mixing valve,
38 control module and two braided hoses.

39 B. Chrome P-trap.

40 C. 1 1/2" S/S basket strainer.

41
42 **ITEM 12 CONVECTION OVEN STACKS**

43 Two stacks required

44 Vulcan

45 Two Model VC66GD, Double stack bakery depth convection ovens with the following accessories:

46 A. Heavy duty locking casters.

47 B. One 48" x 1" Model 1600KITCF2S48PS Dormont or Avtec approved equal model, flexible gas hose with plastic
48 coating, double swivels on both ends and Safety Quick quick disconnect.

49
50 **ITEM 13 40 GALLON KETTLE**

51 Future item.

52
53 **ITEM 14 40 GALLON BRAISING PAN**

54 One required

55 Cleveland

56 One Model VE40 with the following accessories:

- 1 A. 2" tangent draw off valve.
2 B. Double pantry faucet.
3 C. Food strainer for pouring spout.
4 D. Removable pan carrier.
5
6 ITEM 15 RANGE WITH CONVECTION OVEN
7 One required
8 Vulcan
9 One Endurance model 36C-6BN six burner gas range with convection oven base, push button ignition with fully mig
10 welded chassis, lift off burner heads, stainless steel high riser with lift off shelf and with the following accessories:
11 A. Heavy duty locking casters
12 B. One each T&S model HG-4D-48-SK flexible gas hose with quick disconnect and double swivels on each
13 end.
14
15 ITEM 16 FLOOR TROUGH
16 One required
17 Fabricate or Sani-floor approved equal;
18 Furnish one 12 ga. S/S floor trough as shown on the Drawings. Give to GC for early installation. Include beehive strainer
19 for 3" drain. Coordinate the installation with the PC and GC. Include equal sized 1" thick FRP fiberglass reinforced grating
20 with 1" x 4" rectangular grid and non-skid surface. The grating shall be of consistent 1" thick material and shall not use
21 fiberglass rod as tie-bars. The grate sizes are to be identical for all floor troughs unless otherwise noted.
22
23 ITEM 17 OPEN NUMBER
24
25 ITEM 18 OPEN NUMBER
26
27 ITEM 19 WORKTABLE WITH SINKS
28 One required
29 Fabricate
30 One S/S worktable with sink as shown on the Drawings, with the following accessories:
31 A. Two 16" x 20" x 10" deep sinks with T&S B-231 faucet with B-199-1 aerator and with heavy-duty S/S crumb
32 cup waste and S/S splash shield.
33 B. One 20" wide full-length S/S double overshef with pot and pan rack as shown in the elevations.
34 C. Partial sectional removable undershelves.
35 D. Legs, feet and crossrails as shown on the Drawings
36
37 ITEM 20 UTILITY CARTS
38 Three required
39 Lakeside or Focus Foodservice equal
40 Three Model 422.
41
42 ITEM 21 Existing 20 QUART MIXER WITH NEW STAND
43 Existing mixer. FEC to relocate as shown in Drawings and provide the following:
44 Fabricate
45 One S/S mobile mixer stand as shown on the Drawings. Bolt the mixer to the stand. Include the following accessories:
46 A. Full undershef.
47 B. Four Colson #22.05267.95.MTG46.BRK5 TotalLock swivel stem casters, or Jarvis equal. The caster locking device
48 shall lock both the swivel action and the caster rotation with a single thermoplastic brake lever.
49
50 ITEM 22 MOBILE WORKTABLES
51 Four required
52 Fabricate
53 Four S/S mobile worktable as shown on the Drawings, with the following accessories:
54 D. Full undershef.
55 E. Four Colson #22.0567.95 TotalLock swivel stem casters, or Jarvis equal. The caster locking device shall lock both
56 the swivel action and the caster rotation with a single thermoplastic brake lever.

- 1 F. One Component Hardware Model S90-0020 drawer.
2
3 ITEM 23 SLICER WITH STAND
4 One required
5 Hobart
6 One Model HS6 semi-automatic slicer with knife removal tool and training video.
7 Also include one required
8 Fabricate
9 One S/S mobile slicer stand as shown on the Drawings. Include the following accessories:
10 A. Full undershelf.
11 B. Four Colson #2.05267.95.MTG46.BRK5 TotalLock swivel stem casters, or Jarvis equal. The caster locking device
12 shall lock both the swivel action and the caster rotation with a single thermoplastic brake lever.
13
14 ITEM 24 PREPARATION TABLE
15 One required
16 Fabricate
17 One S/S preparation table with sinks as shown on the Drawings. Include the following:
18 A. Two 20" x 21" x 12" deep sink compartments. Provide one-piece front panel. Include drain trough between
19 sinks.
20 B. Pre-cut holes for spray assembly and vacuum breaker.
21 C. Welded disposer collar and control bracket.
22 D. Full-length splash-mounted overshelf. Provide hole in shelf for passage of riser pipe from spray assembly.
23 E. One 2" rotary lever drain.
24 F. One T&S B-133-109-156ADF with aerator.
25
26 ITEM 25 SPRAY AND FILL ASSEMBLY
27 One required
28 T&S Brass & Bronze
29 One T&S Model B-0287 Big Flo pre-rinse spray assembly with faucet with 12" spout and B-0109-01 wall bracket and
30 018200-40 swivel.
31
32 ITEM 26 DISPOSER
33 One required
34 In-Sink-Erator or Salvajor equal model:
35 One Model SS-200-7 short-body disposer with CC-202 control panel, solenoid valve and flow control valve. Include T&S
36 Model B-455 chrome vacuum breaker assembly for mounting on the slope of the backsplash. Provide a cast iron waste
37 outlet in lieu of the standard PVC outlet.
38
39 ITEM 27 OPEN NUMBER
40
41 ITEM 28 OPEN NUMBER
42
43 ITEM 29 ROLL-THRU REFRIGERATOR
44 One required
45 Continental
46 One Model DL2RI-SS-RT-E two door, roll-thru refrigerator, foamed-in place urethane insulation, cam action lift off hinges,
47 and energy saving switch for door heaters. Includes removable stainless steel rack guides, removable stainless steel ramp,
48 and reinforced stainless steel floor. Include two roll-in racks.
49
50 ITEM 30 HOT HOLDING ROLL-THRU CABINETS
51 One required
52 Continental
53 One Model DL2WI-SS-RT-E two door, roll-thru heated food box, foamed-in place urethane insulation, cam action lift off
54 hinges, and energy saving switch for door heaters. Includes removable stainless steel rack guides, removable stainless
55 steel ramp, and reinforced stainless steel floor. Include two roll-in racks.
56
57 ITEM 31 TRAY AND FLATWARE PICK-UP CART

- 1 One required
2 Randell, or Piper approved equal Model
3 One Model RAN-SW-8 with laminate panels in the Architect's choice of standard solid colors.
4
5 ITEM 32 DRY STATION
6 One required
7 Randell, or Piper approved equal Model
8 One Model RAN-ST-2, with laminate in Architect's choice of solid colors. Include one each Model RAN INV 24 folding tray
9 slide.
10
11 ITEM 33 HOT FOOD WELLS
12 One required
13 Randell, or Piper approved equal Model
14 One Model RAN HTD-4S with laminate in Architect's choice of solid colors. Include the following accessories:
15 A. One each Model RAN INV 60 folding tray slide.
16 B. One each RSB-STSSAF full length single sided adjustable glass sneeze guard with heat lamps.
17 C. 4" casters, achieving an overall counter height of 34".
18
19 ITEM 34 DRY STATION
20 One required
21 Randell, or Piper approved equal Model
22 One Model RAN-ST-3, with laminate in Architect's choice of solid colors. Include one each Model RAN INV 36 folding
23 tray slide.
24
25 ITEM 35 COLD FOOD WELL
26 One required
27 Randell, or Piper approved equal Model
28 One Model RS SSO-RCP-4 with laminate in Architect's choice of solid colors. Insert pans to be provided by Owner. Include
29 the following accessories:
30 A. One each Model RAN INV 78 folding tray slide.
31 B. One each RSB-STSSAF full length single sided adjustable glass sneeze guard.
32 C. 4" casters, achieving an overall counter height of 34".
33
34 ITEM 36 MILK COOLER
35 One required
36 Continental
37 One Model MC5N-SS-D, 16 crate dual sided milk cooler, self-contained electric condensate evaporator with locking doors.
38
39 ITEM 37 OPEN NUMBER
40
41 ITEM 38 OPEN NUMBER
42
43 ITEM 39 OPEN NUMBER
44
45 ITEM 40 WASTE AND RECYCLE STATION
46 One required
47 Fabricate
48 One enclosed base S/S waste/recycle stations with sink as shown on the Drawings, with the following accessories:
49 A. One 16" x 20" x 10" deep sink with T&S B-300 faucet with B-199-1 aerator and with heavy-duty S/S crumb cup
50 waste.
51 B. 10" backsplash and finished endsplash.
52 C. Three open cut outs labeled, Milk, Paper and Plastic.
53 D. Include three waste receptacles on dollies, one receptacle for each waste opening.
54 D. S/S doors with recessed door pull, cylinder door lock and laminate. Laminate shall be in Architect/Owner's
55 choice of color WilsonArt or Formica products. Include laminate on sides of unit.
56
57 ITEM 41 SOILED DISHTABLE

- 1 One required
2 Fabricate
3 One soiled dishtable as shown on the Drawings. Include the following:
4 A. Drain trough with removable S/S perforated scrap basket.
5 B. Pre-cut holes for faucets, pre-rinse spray and vacuum breaker.
6 C. 10" high backsplash and endsplash.
7 D. One 20" x 20" x 12" deep sink with removable "H" frame.
8 E. Welded disposer collar and disposer control bracket.
9 F. Raised tray drop ledge.
- 10
11 ITEM 42 PRE-RINSE SPRAY ASSEMBLY
12 One required
13 T&S Brass & Bronze
14 One T&S B-0133-BJ-B-0156-B-0199-01. 1.07GPM low flow spray valve.
15
- 16 ITEM 43 DISPOSER
17 One required
18 In-Sink-Erator or Salvajor equal model:
19 One Model SS-200-7 short-body disposer with CC-202 control panel, solenoid valve and flow control valve. Include T&S
20 Model B-455 chrome vacuum breaker assembly for mounting on the slope of the backsplash. Provide a cast iron waste
21 outlet in lieu of the standard PVC outlet.
22
- 23 ITEM 44 STAINLESS STEEL WALL COVERING
24 Lot required
25 Fabricate
26 Provide 18 ga. #4 finish S/S panels above dishtable splashes and behind the dishwasher as shown. The paneling shall
27 extend from a point below the top of the backsplashes to the finished ceiling. The paneling behind the dishwasher and
28 behind the dishtable returns to the dishwasher shall begin at a point 30" AFF and shall extend upwards to the finished
29 ceiling. Vertical joints between the panels shall be covered with Component Hardware Model J64-1450 AH@ strips. Edges
30 shall be capped with Component Hardware S/S continuous U-clips. Seal the panels with clear silicone. All panels shall
31 be securely attached with a generous amount of clear silicone on the full perimeter of each panel (blind caulking) and on
32 the rear surfaces in order to achieve a tight, flat, bonding of the panels to the walls. Make close-fitting cut-outs for all
33 utilities.
34
- 35 ITEM 45 CONDENSATE HOOD
36 One required
37 Halton
38 One Model CH, 8'-6" x 4' x 2' high with two U.L. Listed HCL vapor-proof LED lights wired to a single point connection "J"
39 box located in the hood. Ventilator shall be all S/S, not less than 18 gauge type 304 with #3 finish on exposed surfaces.
40 Hood fan control and light switch location shall be located as shown in the foodservice electrical rough-in drawings.
41 Bottom of hood to be 80" AFF. Top of hood to extend a minimum of 1" through the finished ceiling. Hang the hood using
42 non-ferrous rods. Install with a minimum of 18" overhang on the soiled end and 27" overhang on the clean end of the
43 dishwasher. Coordinate duct opening with the Mechanical Contractor.
44
- 45 ITEM 46 DISHWASHER
46 One required
47 Hobart
48 One Model CL44eN-ADV Advansys dishmachine, operation as shown in the Drawings, with the following accessories:
49 A. Electric heat.
50 B. Drain Water Energy Recovery system, maximum water consumption 126 GPH.
51 C. Automatic Soil Removal system.
52 C. Pre-plumbed 30KW built-in booster heater.
53 D. Table limit switch.
54 E. Two each Vollrath/Traex TR23 sheet pan racks.
55 F. Single point electrical connection.
56 G. NSF certified Pot and Pan mode.
57

- 1 *Drain water tempering kit built into dishmachine with Drain Water Energy Recovery.
2
3 ITEM 47 CLEAN DISHTABLE
4 One required
5 Fabricate
6 One clean dishtable as shown on the Drawings. Include the following:
7 A. Table limit switch.
8 B. One 12" x 60" S/S flat wall shelf.
9 C. 10" high backsplash.
10
11 ITEM 48 OPEN NUMBER
12
13 ITEM 49 POT AND PAN SHELVING
14 One lot required
15 InterMetro, Olympic or Cambro approved equal;
16 Provide the following:
17 A. Ten each 2448 shelves.
18 B. Eight each 74P posts.
19
20 ITEM 50 FOUR COMPARTMENT SINKS
21 One required
22 Fabricate
23 One utensil sink as shown on the Drawings. Include the following:
24 A. Welded disposer collar.
25 B. Partial undershelf, as shown on the Drawings.
26 C. 10" high backsplash and endsplashes.
27 D. Four 20" x 28" x 12" deep sinks.
28 E. Three 2" rotary lever drains.
29 F. Two T&S B-231 faucet with aerator.
30 G. Pre-cut holes for faucet, pre-rinse spray and vacuum breaker
31
32 ITEM 51 PRE-RINSE SPRAY ASSEMBLY
33 One required
34 T&S Brass & Bronze
35 One T&S Model B-0287 Big Flo pre-rinse spray assembly with faucet with 12" spout and B-0109-01 wall bracket and
36 018200-40 swivel.
37
38 ITEM 52 DISPOSER
39 In-Sink-Erator or Salvajor equal model:
40 One Model SS-200-7 short-body disposer with CC-202 control panel, solenoid valve and flow control valve. Include T&S
41 Model B-455 chrome vacuum breaker assembly for mounting on the slope of the backsplash. Provide a cast iron waste
42 outlet in lieu of the standard PVC outlet.
43
44 ITEM 53 EYE WASH
45 Provided by PC.
46
47 ITEM 54 OPEN NUMBER
48
49 ITEM 55 OPEN NUMBER
50
51 ITEM 56 BEVERAGE TABLE
52 One required
53 Fabricated
54 One enclosed base S/S worktable with sink as shown on the Drawings, with the following accessories:
55 A. 10" backsplash and endsplash.
56 B. Undershelf with open area at rear for utilities.
57 C. Adjustable mid-shelves.

- 1 D. S/S doors with recessed door pulls, cylinder door lock and laminate. Laminate shall be in Architect/Owner's
2 choice of color WilsonArt or Formica products.
3 E. Provisions for Items 57 and 58.
4

5 ITEM 57 COFFEE MAKER
6 Provided by beverage supplier.
7

8 ITEM 58 ICE AND WATER DISPENSER

9 Two required

10 Hoshizaki

11 Two Model DCM-270BAH-OS countertop water dispenser, ice maker & dispenser with S/S legs, include one H9320-51
12 water filter and one Franke ECO ICE antimicrobial ice protection unit.
13
14
15

16 **PART THREE - EXECUTION**

17
18 GENERAL

19
20 Furnish to appropriate trades at a sufficiently early date all floor troughs or other equipment and accessories to be
21 installed by that trade.
22

23 All plumbing and electrical and HVAC components scheduled to be installed by separate trades shall be tagged with item
24 numbers and given to those trades. Obtain a receipt for same.
25

26 Any existing equipment scheduled to be re-used or disposed of shall be disconnected by the appropriate trade. Relocate
27 and install those items according to instructions given for new equipment and in accordance with instructions given in
28 the Equipment Schedule.
29

30 Remove crating and rubbish on a daily basis. Verify with GC on availability of on-site trash disposal area.
31

32 Protect all new and relocated foodservice equipment from damage until final acceptance by the Owner.
33

34 INSTALLATION

35
36 Provide a competent foreman to direct the Work and to advise counsel other trades regarding proper installation and
37 connection of the equipment, per manufacturer's instructions. Assist trades in temporary relocation of equipment as
38 required to make connections. Instruct trades on equipment manufacturer's connection details. Align and level
39 equipment as connections are completed.
40

41 Set and level all non-mobile equipment to the correct height and anchor where indicated and/or required for secure
42 installation. Use concealed anchors wherever possible. Anchors are to be noncorrosive and of adequate size for the
43 Work. Align adjoining pieces of equipment for flush fit wherever applicable.
44

45 Cut holes in foodservice equipment for fixtures, conduit, receptacles, cords, pipes and ducts. Provide sleeves or ferrules,
46 etc.
47

48 All permanent equipment installed against walls, floors, ceilings or other equipment shall be sealed to same with clear
49 food-grade silicone sealant. Sealant is to be applied smoothly and in a concave shape, forming an air-tight and waterproof
50 barrier.
51

52 Install trim strips with mastic. Use S/S machine screws or other noncorrosive fasteners when the use of mastic is not
53 adequate. Trim strips at the top of backsplashes will not be permitted. Equipment must fit walls to within 1/4".
54 Equipment installed in or through walls shall be trimmed to same with trim of same material and finish as the equipment.
55 Rivets may not be used as fasteners on custom fabricated equipment.
56

1 Field joints in S/S shall be made by welding. Welding shall be by electric method and shall be made with a welding rod
2 of the same composition as the sheets or parts being welded. Welds shall be complete welds, strong and ductile, with
3 excess metal ground off and joints finished smooth to match adjoining surfaces. Welds shall be free of mechanical
4 imperfections, such as gas holes, depressions, pits, runs and cracks, and shall have the same color as adjoining sheet
5 surfaces. Joints shall be continuously welded so that the fixtures appear as one-piece construction. Butt welds made by
6 spot welding straps under seams, filling in the void with solder and finishing by grinding are not acceptable.

7
8 Spot welds shall have a maximum spacing between welds of 3". Tack welds shall have at least 1/4" length of welding
9 material at a maximum spacing of 4". Welds at the ends of channel battens shall not exceed 2" centers. Recoat galvanized
10 members that have been cut, welded or damaged.

11
12 Wherever break bends occur, they shall be free of undue extrudence and any marks shall be removed by grinding and
13 polishing. Sheared edges shall be free of burrs or irregular projections and shall be finished to eliminate danger of cutting
14 or laceration.

15
16 Grain of polishing shall run in the same direction on all horizontal and on all vertical surfaces of each item of fabricated
17 equipment. Where table or sink tops join at right angles, the finish shall terminate in a mitered edge.

18 19 ELECTRICAL REQUIREMENTS

20
21 Comply with standards of NEC, UL and NEMA and with the requirements of the prevailing code authority.

22
23 Provide attached cordsets where cords are indicated on the foodservice Electrical Schedule. Cordsets are to be neoprene,
24 of adequate length. EC to match receptacle to cap.

25 26 PLUMBING REQUIREMENTS

27
28 All plumbing work shall be in accordance with prevailing codes and regulations.

29
30 Furnish to the PC for installation all control valves, valve-type wastes, vacuum breakers, pressure reducing valves, check
31 valves, solenoid valves, water filters, etc., as indicated in the Section 11 40 00 Contract Documents. Furnish gas pressure
32 regulators for all foodservice equipment requiring pressures below 14" W.C.

33
34 Furnish chrome piping and chrome angled flanged fittings where vacuum breakers extend above backsplash. Installation
35 by PC.

36
37 Flexible gas lines shall have a detachable S/S restraining cable, securely attached to the wall or floor and the equipment,
38 of such length as to prevent undue stress on the flexible gas line or connection.

39 40 HVAC REQUIREMENTS

41
42 All HVAC work shall be in accordance with prevailing codes and regulations.

43
44 Cut exhaust duct openings in ventilators in coordination with the HC.

45 46 REFRIGERATION REQUIREMENTS

47
48 Refrigeration systems shall be installed by a knowledgeable, skilled, and licensed refrigeration contractor, who shall
49 perform the work according to ASHRAE standards and the conditions of the Contract Documents. Systems shall be
50 installed, charged, started, tested and fully operational.

51
52 Condensing units shall be securely mounted with adequate clearance for service.

53
54 Systems shall be designed to operate not more than 18 hours per day in a 100 degree F. ambient condensing temperature.
55 Walk-in refrigerator compartments shall operate at 35 degree F. with evaporator at 10 degree T.D. Walk-in freezer
56 compartments shall operate at -10 degree F. with a 10 degree F T.D. at -20 degree suction temperature. Suction lines

1 shall be sized for maximum pressure drop of 2# on medium temperature and 1# on low temperature systems. Liquid lines
2 shall be sized for a maximum pressure drop of 3#.

3
4 All systems shall be designed for thermostatic expansion valves and pressure switches and shall operate on specified
5 refrigerant.

6
7 Refrigeration lines shall conform to ASHRAE or National Board of Fire Underwriters standards, whichever is greater.
8 Piping shall be Type "L" copper, cut with a tube cutter and sized. Use braising rod of no less than 15% silver. Fittings shall
9 be wrought copper.

10
11 Piping shall be installed with hangers at no more than 10 foot intervals horizontally and 6 foot intervals vertically. Provide
12 an oil trap at outlet of evaporator coils.

13
14 Insulate medium suction and condensate lines with 3/4" Armaflex, or Rubatex and insulate all low suction and condensate
15 lines with 1" Armaflex or Rubatex. For all ultra low suction lines (below -20 degrees) use manufacturer recommendations.
16 Condensate lines are to be provided by the PC. Cooler condensate lines shall not pass through freezer compartments.
17 Provide walk-in freezer condensate lines with self-regulating heat tape applied under the insulation. EC shall connect the
18 tape.

19
20 Provide sleeves for refrigerant piping and condensate piping wherever it passes through a walk-in cooler or freezer wall,
21 floor or ceiling. Pack sleeve with fiberglass and Perma-gum after installation. Sleeves through walls shall be flush with
22 walls.

23
24 Thermometers shall be installed on the exterior of each walk-in box near the door. Calibrate thermometers after three
25 days operation. Extend sensor capillaries away from doors and secure to the walls.

26
27 Mount all specified lights in walk-in boxes for connection by the EC. Provide bulbs suitable for the specified ambient
28 temperature. Fluorescent light fixtures shall be surface mounted, NSF and UL Listed, suitable for wet and low-temp areas
29 and shall be 48" long with two tubes and removable lens.

30
31 Clean, dehydrate and evacuate the system. Check for leaks over a period of 24 hours at a vacuum of 500 or less microns
32 with no appreciable pressure drop. Liquid lines shall be pressurized according to prevailing refrigeration codes for 24
33 hours with a maximum decrease of 3 PSI.

34 35 FIRE SYSTEMS

36
37 Fire systems shall conform to NFPA Pamphlets 17A and 96, U.L. 300 and rulings of authorities having local jurisdiction.

38
39 Systems shall provide hood, duct and surface protection. Piping shall be concealed wherever possible. Exposed piping
40 shall be Type 304 18-8 S/S or chrome plated.

41
42 Furnish required size gas fire/fuel shut-off valve to PC for installation. Furnish control head microswitch for electrical
43 equipment requiring surface protection. Shunt trip breakers shall be provided by the EC.

44
45 Include first year semi-annual checkout.

46 47 CLEANING

48
49 When installation is complete, remove all tape from the equipment and all debris from the work areas and leave the
50 facility broom clean. Equipment shall be left with scratches buffed out and any painted surface damage touched-up.
51 Replace work that cannot be properly restored. Equipment is to be left free of dirt and reasonably free of dust. Final
52 cleaning and sanitizing is to be done by Owner.

53 54 55 **PART FOUR - UTILIZATION**

56 57 COMMISSIONING

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19

Equipment shall be started and tested by factory-authorized service agencies.

Lubricate, start-up, test and adjust equipment prior to Owner's inspection and demonstration. Repair or replace equipment that is not fully operational or is noisy or vibrating. When cleaning and testing and adjusting is complete, notify Architect in writing.

OPERATION AND USE

When cleaning, testing and adjusting have been completed and operation and maintenance manuals approved, arrange for demonstration times at Owner's convenience but during normal working hours. Demonstrations shall be done by competent, trained personnel, thoroughly familiar with the operation, techniques of usage, capacities and maintenance of the equipment.

The FSC contract representative for this Project shall be present at all equipment demonstrations.

Furnish all warranty cards and advise Owner to complete and file the registrations. Demonstration and instruction may take up to two full days.

END OF SECTION

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**SECTION 12 24 13
ROLLER WINDOW SHADES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior manual roller shades.
- B. Interior motorized roller shades.
- C. Motor controls.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
 - 2. Coordinate the work with other trades to provide rough-in of electrical wiring as required for installation of hardwired motorized shades.
- 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.

1.3 SUBMITTALS

- A. See Section 01 3300 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. 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.
- D. Selection Samples: Include fabric samples in full range of available colors and patterns.
- E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.4 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.

1.5 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.

1.6 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Interior Manually and Motorized Operated Roller Shades:
 - 1. SWF Contract – Basis-of-Design.
 - 2. Draper, Inc.
 - 3. Hunter Douglas Architectural.
 - 4. Or approved equal.

2.2 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.

- 3. Chain-and-Clutch Operating Mechanism: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - a. Spring Lift-Assist Mechanism: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
- 4. Motorized Shades: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed or recognized to UL 325.
 - a. Comply with NFPA 70.
 - b. Electrical Components: Listed, classified, and labeled as suitable for the purpose intended. Where applicable, system components to be FCC compliant.
 - c. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view; fully compatible with controls to be installed.

2.3 SHADE FABRIC

- A. Fabric - Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 - 1. Color: As indicated on Drawings.

2.4 MOTOR CONTROLS

- A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- B. Provide all components and connections necessary to interface with other systems as indicated.
- C. Individual Switch Control Station: Maintained-contact, wall-switch-operated control station with open, close, and center off functions.

2.5 ROLLER SHADE FABRICATION

- A. Product Safety Standards: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Field measure finished openings prior to ordering or fabrication.
- C. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.2 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.

3.3 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.

3.4 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

END OF SECTION

**SECTION 12 36 61.16
SOLID SURFACING COUNTERTOPS**

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Solid surface material countertops.
 2. Solid surface material backsplashes.
 3. Solid surface material end splashes.
 4. Solid surface material sinks.

- B. Related Requirements:

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
1. Show locations and details of joints.
 2. Show direction of directional pattern, if any.
- C. Samples for Initial Selection: For each type of material exposed to view.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.6 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ISFA 2-01.
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. Durasein Solid Surface; a brand of Relang International, LLC
 - b. Formica Corporation
 - c. Hanex (Hyunday L&C USA)
 - d. Swan Surfaces LLC (Swanstone)

- 1 e. Vendura Industries – Basis-of-design.
- 2 f. Wilsonart LLC
- 3 2. Type: Provide Standard type unless Special Purpose type is indicated.
- 4 3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
- 5 4. Colors and Patterns: As indicated on Drawings.
- 6 B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

7 **2.2 FABRICATION**

- 8 A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the
- 9 AWI/AWMAC/WI's "Architectural Woodwork Standards."
- 10 1. Grade: Premium.
- 11 B. Configuration:
- 12 1. Front: Straight, slightly eased at top with separate apron, 6 inches high, recessed 1/4-inch behind front
- 13 edge.
- 14 2. Backsplash: Straight, slightly eased at corner.
- 15 3. End Splash: Matching backsplash.
- 16 C. Countertops:
- 17 1. 1/2-inch- thick, solid surface material .
- 18 D. Backsplashes: 1/2-inch- thick, solid surface material.
- 19 E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with solid surface material
- 20 manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- 21 1. Fabricate with loose backsplashes for field assembly.
- 22 2. Install integral moulded sink bowls in countertops in the shop.
- 23 F. Joints:
- 24 1. Fabricate countertops without joints.
- 25 G. Cutouts and Holes:
- 26 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by
- 27 fixture manufacturer. Form cutouts to smooth, even curves.
- 28 2. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

29 **2.3 INSTALLATION MATERIALS**

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

31 **PART 3 - EXECUTION**

32 **3.1 EXAMINATION**

- 33 A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be
- 34 installed, with Installer present, for compliance with requirements for installation tolerances and other conditions
- 35 affecting performance of countertops.
- 36 B. Proceed with installation only after unsatisfactory conditions have been corrected.

37 **3.2 INSTALLATION**

- 38 A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference
- 39 between planes of adjacent units.

- 1 B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to
2 align subtops in a level plane.
- 3 C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written
4 instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with
5 manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire
6 surface.
- 7 D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of
8 countertops and splashes adjacent to joints to prevent adhesive smears.
- 9 E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints
10 to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by
11 manufacturer.
- 12 F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while
13 cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling
14 is required for clearance. Ease edges slightly to prevent snipping.
- 15 G. Apply sealant to gaps at walls; comply with Section 07 9200 "Joint Sealants."

16

END OF SECTION

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**SECTION 12 93 13
BICYCLE RACKS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Ground mounted bicycle racks.

1.2 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide bicycle racks that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 3300.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.
- C. Shop Drawings: Show fabrication and installation details, and attachments to other work.
- D. Verification Samples: For each type of exposed finish required, prepared on samples in manufacturer's standard size.
- E. Warranties: Warranties specified in this Section.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing bicycle racks similar to those required for this Project and with a record of successful in-service performance.
- B. Installer Qualifications: An experienced installer who has completed installation of bicycle racks 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. Source Limitations: Obtain bicycle racks through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store materials to comply with manufacturer's directions to prevent deterioration from moisture, heat, cold, direct sunlight, or other causes.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

1.7 WARRANTY

- A. Warranty: Manufacturer's standard form in which manufacturer warrants the product to be free from defect in material and workmanship and agrees to replace any product or part thereof found to be defective without charge during the warranty period. Warranty does not include wear from normal use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers.
 - 1. American Bicycle Security.
 - 2. Cycle-Safe.
 - 3. Creative Pipe.
 - 4. Dero Bike Rack. – Basis-of-design.
 - 5. Madrax, Inc.
 - 6. Saris.
 - 7. Approved Equal.

14 24 20
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Base Bid Section Includes: Project work consists of furnishing and installing two (2) hydraulic passenger elevators with elevator machine rooms and above ground hydraulic cylinders. Controls shall be non-proprietary.
- B. Work Required:
 - 1. Work of this section includes providing equipment, incidental material, transportation, all permits, all taxes and all labor required for a complete and operable elevator installation and all related maintenance of the newly installed equipment. This specification provides a broad outline of required equipment and does not describe the details of design and construction. Elevators shall be erected, installed, adjusted, tested and placed in operation by qualified elevator installers.
 - 2. All work shall be performed in a first class, safe and workmanlike manner.
 - 3. Coordinate work with other trades to provide necessary conduits for proper installation of wiring, including, but not limited, the items listed below.
 - a. Elevator pit for lighting and sump pump.
 - b. Fire alarm panel.
 - c. Card reader security
 - d. Cameras
 - e. Emergency generator transfer switch.
 - 4. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make a complete installation.
 - 5. Attend preinstallation meeting with other trades and general contractor at least one week prior to the start of this work to review installation schedule and coordination with other related work.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications, apply to this Section.
- B. The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer. Also see elevator shop drawings for requirements.
 - 1. **Division 1 - Construction Facilities and Temporary Controls:** Protection of floor openings and personnel barriers; temporary power and temporary lighting.
 - 2. **Division 3 - Concrete:** Elevator pit, and installation of guide rail inserts.
 - 3. **Division 4 - Masonry:** Hoistway enclosure with fire-resistant rating as required by IBC Section 3002.1, install guide rail inserts, building-in and grouting hoistway door frames, grouting up to hoistway sills. Cutting and patching for hall signal fixture recess boxes, control room.
 - Division 5 - Metals:** Auxiliary support steel for supporting entrances and guide rails, hoisting beam at top of hoistway, bevel recesses and projections of more than 4", machine room door. A minimum of two lifeline attachments capable of withstanding 5,000 lb load per OSHA 29 CFR 1926.502, at the top front of the new hoistway.
 - 4. **Division 7 - Waterproofing:** Waterproofing of elevator pit.
 - 5. **Division 9 - Finishes:** Finish flooring in elevator car enclosure.
 - 6. **Division 21 - Fire Suppression:** Sprinklers, where required by the Building Code, installed per NFPA 13.
 - 7. **Division 22 - Plumbing:** Indirect drain or sump with flush grate and pump, complying with SPS 382.33 and 382.36. Minimum rating 3,000 gph for an elevator pit serving two elevators.
 - 8. **Division 23 - Heating, Ventilating, and Air Conditioning:** Hoistway opening protection per Building Code requirements, ventilation and temperature control of elevator equipment in machine room.
 - 9. **Division 26 - Electrical:**

- 1 a. Fused disconnect switch or circuit breaker capable of being locked in the open position for mainline power.
- 2 b. Electrical power for elevator installation and testing, including temporary power where required by elevator
- 3 contractor.
- 4 c. Notification to elevator controller from automatic transfer switch indicating when elevator is on emergency
- 5 power and notification of pending switch back to normal power.
- 6 d. Branch circuit for car lighting with lockable OCPD 15 amp protection.
- 7 e. GFCI receptacles in elevator pit.
- 8 f. GFCI protected receptacle in machine room.
- 9 g. Single non-GFCI receptacle in pit for sump pump use.
- 10 h. Lighting in machine room and pit with switch and guards.
- 11 i. Telephone service wired to controller.
- 12 j. Fire alarm initiating devices at elevator landings and in machine room, shunt trip devices where sprinklers are
- 13 provided in the hoistway overhead or machine room.
- 14 k. Emergency power for elevator systems, 110v lighting and control room HVAC. See Section 2.06 for more detail.
- 15 10. **Other:**
- 16 a. ABC fire extinguisher inside elevator machine room.
- 17 b. Finish flooring in elevator car enclosures.
- 18 c. Security camera for installation inside elevator.
- 19 d. Card reader security for hall station controls.
- 20 e. Removable barricades at all hoistway openings in compliance with OSHA 29 CFR 1926.502.

21 **1.3 REFERENCED CODES**

- 22 A. Comply with applicable building and elevator codes, including but not limited to the following:
- 23 1. ASME A17.1/CSA B44-2016, Safety Code for Elevators and Escalators.
- 24 2. ADAAG, American Disabilities Act Accessibility Guidelines.
- 25 3. ICC/ANSI A117.1-2009, Accessible and Usable Buildings and Facilities.
- 26 4. NFPA 70- 2017, National Electrical Code.
- 27 5. NFPA 72-2019, National Fire Alarm and Signaling Code.
- 28 6. Wisconsin Administrative Code SPS 318, effective 5/01/2021.
- 29 7. Madison General Ordinance Chapter 40.
- 30 8. Commercial Building Code IBC-2015.
- 31 9. All other applicable codes.

32 **1.4 SYSTEM DESCRIPTION**

- 33 A. Passenger Elevator #1-2:
- 34 Equipment Requirements (Verify with elevator manufacturer)
- 35 1. Quantity & Elevator No: Two (2), Elevator #1-2 (Duplex Operation)
- 36 2. Type: Hydraulic passenger elevator with Class A loading.
- 37 3. Application: Above ground hydraulic cylinders with machine room.
- 38 4. Net Travel: Approximately 14' 0" (refer to plans)
- 39 5. Number of Stops: 2 front
- 40 6. Landings: In-line *1 to 2
- 41 7. Rated Capacity: 5,000 lbs
- 42 8. Rated Speed: 125 fpm
- 43 9. Minimum Car Inside: 5' 8" wide x 8' 4" deep

- 1 10. Hoistway Dimensions: 15' 8-1/2" wide x 10' 2-1/4" deep (final layout TBD)
- 2 11. Pit Depth: 4' 0"
- 3 12. Clear Overhead: 17' 0" maximum to underside of hoistway
- 4 15' 8" to underside of hoisting beam
- 5 13. Inside Cab Height: 7' 9" minimum
- 6 14. Entrance Size & Type: Two speed side opening, minimum 4' 0" wide x 7' 0" high
- 7 15. Power Unit Location: Machine room per architectural drawings
- 8 16. Controller Location: Machine room per architectural drawings
- 9 17. Main Power Supply: 480 Volts + or - 5% of normal, 3 Phase, with a
- 10 separate equipment grounding conductor. (Verify)
- 11 18. Lighting Power Supply: 120 Volts, single phase, 15 Amp, 60 Hz
- 12 19. Signal Fixtures: Manufacturer's vandal resistant with metal push buttons
- 13 20. Emergency Power Operation: To be provided
- 14 B. Performance and Ride Quality (Elevator #1-2)
- 15 1. Door Opening Time: 3.5 seconds
- 16 2. Door Closing Time: 4.3 seconds
- 17 3. Floor-Floor Performance: 16.5 seconds (12' floor heights)
- 18 4. Rated Speed: ±3% of contract speed under any loading condition
- 19 5. Stopping Accuracy: ± 0.2 in. under any loading condition or direction
- 20 11. Re-leveling Distance: ± 0.4 in. maximum
- 21 C. The elevator shall be installed and adjusted to meet maintenance standards as published in the NEII-1 Building
- 22 Transportation Standards and Guidelines by the National Elevator Industry, Inc. Compliance with paragraphs A-B above
- 23 and NEII performance standards shall be in addition to requirements for the State of Wisconsin and City of Madison
- 24 elevator acceptance inspection and certification process. Elevator shall comply with the minimum performance
- 25 standards at final acceptance and throughout the warranty period.
- 26 D. Duplex Operation: Using a microprocessor-based controller, the operation shall be automatic by means of the car and
- 27 hall buttons. If all calls in the system have been answered, the cars shall park at the last landing served.
- 28 E. Provide microprocessor-based control system which utilizes on-board diagnostics for servicing, trouble-shooting, and
- 29 adjusting without requiring the use of a service tool. If an on-board diagnostic system is not provided, a handheld
- 30 service tool (or laptop computer), permanent owner's license with terms acceptable to Owner, operation manual, and
- 31 tool instructions must be provided in addition to the control system. Any access code needed for on-board or service
- 32 tool diagnostics or adjusting shall be disclosed to Owner and elevator Consultant and shall not be subsequently changed
- 33 during or at the end of the one year warranty and service periods.
- 34 F. Operating Features – Standard
- 35 1. Full Collective Operation
- 36 2. Anti-nuisance
- 37 3. Load Weighing Bypass
- 38 4. Automatic Fan and Light Shutdown
- 39 5. Firefighters' Service Phase I and Phase II Operation
- 40 6. Top of Car Inspection
- 41 7. Two Speed Fan
- 42 8. Keyed Hoistway Access Operation from both terminal landings
- 43 9. Independent Service Operation
- 44 10. Provision for future Card Reader with four (4) twisted shielded pair in traveling cable (Card reader, if provided, is by
- 45 Others and installed by Elevator Contractor on car operating panel).

- 1 11. Provision for camera with (1) Cat5e in traveling cable.
- 2 12. Emergency Power Operation.
- 3 G. Control Systems: Control systems of proprietary design, such as those designed by Otis, Kone, Schindler and TK Elevator
- 4 are not acceptable. SIM or other cards shall not be removed and all software furnished with the project shall become the
- 5 property of the Owner. Provide elevator controls manufactured by GAL, Smartrise or MCE.
- 6 H. Door Control Features:
- 7 1. Provide a closed loop, microprocessor based linear door operator system. The door operator will facilitate smooth
- 8 operation under varying environmental influences such as, temperature, wind, friction, and component variation.
- 9 The processor will monitor the door's actual position and velocity compared to its desired position and velocity. If
- 10 variations are detected in the profile the command will be automatically corrected. The Closed Loop Door Operator
- 11 control system shall be located on the car top.
- 12 2. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
- 13 3. Car opening shall be provided with a non-contact electronic reopening device that will stop and reopen the car
- 14 door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person. Door
- 15 protection shall consist of a two-dimensional, multi-beam array projecting substantially across the entire car door
- 16 opening with a minimum of 40 beams.
- 17 4. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.
- 18 **1.5 SUBMITTALS**
- 19 A. Project Schedule to be submitted within 30 days of award.
- 20 B. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:
- 21 1. Signal and operating fixtures, and operating panels.
- 22 2. Cab design, dimensions and layout.
- 23 3. Hoistway-door and frame details.
- 24 4. Electrical characteristics, including HP, FLA and connection requirements.
- 25 5. Expected heat dissipation of elevator equipment in hoistway and control room, where provided (BTU/hr).
- 26 C. Shop Drawings: Submit approval layout drawings per SPS 318.1007. Include the following:
- 27 1. Car, guide rails, buffers, and other components in hoistway.
- 28 2. Maximum rail bracket spacing and location of each rail bracket.
- 29 3. Maximum loads imposed on guide rails requiring load transfer to building structure.
- 30 4. Loads on hoisting beam.
- 31 5. Clearances and travel of car.
- 32 6. Clear inside hoistway, clear overhead, control room, and pit dimensions.
- 33 7. Signal fixtures.
- 34 8. Location and sizes of access doors, hoistway entrances and frames.
- 35 9. Description of all SIL rated devices
- 36 D. Color Selection: Submit color charts of exposed finishes and materials for color selection from manufacturer's full range
- 37 of standard colors, patterns, and finishes.
- 38 1. When requested, submit 3" square samples of car finishes and materials.
- 39 E. Operating and Maintenance Manuals: Provide one (1) electronic copy and one (1) separate hard copies of
- 40 manufacturer's operating and maintenance instructions.
- 41 1. Bound manual or 8-1/2" x 11" binders with durable plastic cover, project and specification section identified on
- 42 binder spine and cover.
- 43 2. Table of contents and index tabs dividing sections.
- 44 3. Complete replacement parts listing with part numbers and sourcing information.
- 45 4. Firefighters' Emergency Operation instructions.

- 1 5. Emergency Power Operation.
- 2 6. Operation, maintenance, and repair procedures for major components.
- 3 7. Adjustment, maintenance, and troubleshooting instructions for elevator controls including drive.
- 4 8. Detailed test procedures for all applicable Category 1 and Category 5 tests including detailed instructions for all SIL
- 5 rated devices.
- 6 9. Maintenance manual submittal shall also comply with SPS 318.1007(2)(d).
- 7 10. O&M documents must be submitted to and approved by Consultant before issue of final invoice.
- 8 F. Wiring Diagrams: Provide legible "As-Built" schematic wiring diagrams of new control systems, which shall reflect all
- 9 field revisions and factory updates. Provide one additional complete set each in electronic format and a full-sized hard
- 10 copy in addition to a set stored in the elevator controller.
- 11 G. Test Reports: Inspection reports from City of Madison to document acceptance of elevator system installation.
- 12 H. Keys: Two (2) switch keys shall be provided for each and every key switch provided, properly tagged and identified for
- 13 function to Owner.

14 **1.6 QUALITY ASSURANCE**

- 15 A. Manufacturer: Elevator manufacturer shall be ISO 9001 certified.
- 16 B. Manufacturer: Provide elevator manufactured by a firm with a minimum of 10 years of experience in fabrication of
- 17 elevator equivalent to those specified for this project. The controller, signal fixtures, door operator equipment, car
- 18 frame and platform, and car enclosure must be produced by the manufacturer, and not be part of a purchased,
- 19 assembled, or locally fabricated system.
- 20 C. Installer: Contractor shall use skilled installers, trained and experienced in installing the equipment. All work shall be
- 21 performed in a workmanlike manner and is to include all materials, accessories, and labor necessary for a complete and
- 22 proper operating system. Where a device or part of the equipment is referred to in the singular number, it is intended
- 23 that such reference shall apply to as many devices as are required to complete the installation.
- 24 D. Regulatory Requirements: Elevator system design and installation shall comply with all applicable safety codes (see
- 25 Section 1.03). Apply for any permits necessary for work under this Section, pay all State and Local permit and inspection
- 26 fees, and obtain cutting or burning permits as required.
- 27 E. Fulfill and maintain all licensing requirements of SPS 305 and SPS 318 for the duration of the installation, maintenance,
- 28 and warranty periods.
- 29 F. Provide copies of permit application "Conditionally Approved" by City of Madison Fire Department to Owner. The
- 30 elevator approval shall be posted prior to construction at or near the equipment space, and a copy of the approved
- 31 elevator plans shall be available at the site.
- 32 G. Provide permits, associated fees, and perform all required inspections and tests. The elevator contractor shall pay
- 33 reinspection fees for deficiencies or violations that are the responsibility of the elevator contractor or his subcontractors
- 34 per terms of this Section.

35 **1.7 DELIVERY, STORAGE, AND HANDLING**

- 36 A. Deliver materials in original, unopened protective packaging. Temporary storage of materials, job boxes, etc. outside of
- 37 the elevator hoistway must be arranged with the General Contractor. The elevator contractor shall provide off-site
- 38 storage until components are needed, as required by General Contractor. Protect equipment and finishes from damage
- 39 during transportation, storage, and construction.
- 40 B. The elevator contractor shall keep work areas orderly and free from debris during the course of installation and clean up
- 41 on a daily basis. If areas are not kept clean, Owner may clean those areas and deduct cost from contract. The elevator
- 42 contractor shall regularly remove trash, materials, cartons, etc. generated by their work from the premises.
- 43 C. Provide protective coverings, barriers, etc. to protect car enclosure, entrances and door panels, and other equipment
- 44 and finishes. All expenses of repairing work of other Trades damaged by elevator contractor shall be borne by elevator
- 45 contractor.

46 **1.8 WARRANTY**

- 47 A. All equipment shall be warrantied by the elevator contractor for a period ending 12 months after the date of final
- 48 elevator acceptance by Owner. Warranty shall include correction of defective material or workmanship to the

- 1 satisfaction of the Owner. Materials and workmanship of installation shall comply in every respect with the Contract
2 Documents.
- 3 B. Warranty excludes ordinary wear and tear or improper use, vandalism, abuse, misuse, or neglect or other causes beyond
4 the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied,
5 including any warranty of merchantability or fitness for a particular purpose.
- 6 C. The Owner shall have the right to reject defective or inferior material or workmanship. The elevator contractor shall
7 make modifications, adjustments, and improvements of new equipment and shall meet the performance requirements
8 of this specification at no additional cost to Owner.
- 9 D. "Defective" is defined to include, but not limited to, operation or control system failures, failure of new components,
10 performance below required minimum standards, excessive wear, unusual deterioration or aging of materials or finishes,
11 finishes not complying with specifications, the need for excessive maintenance, unsafe conditions, the need for excessive
12 maintenance, abnormal noise or vibration, and other unusual, unexpected, or unsatisfactory conditions.

13 **1.9 MAINTENANCE AND SERVICE**

- 14 A. In addition to the warranty provisions, provide "complete maintenance" and 24 - hour callback service for a period
15 continuing for 12 months after final acceptance of the elevator by Owner. The cost of overtime callbacks shall be the
16 responsibility of the Elevator Contractor.
- 17 B. Beginning with final acceptance of the elevator by Owner, a minimum of twelve (12) inspections are required in the 12
18 month warranty and maintenance period, at approximately 30 day intervals. In the event the minimum site visitations
19 are not provided as stipulated here, the elevator contractor shall extend the warranty and complete maintenance
20 periods, and provide extended coverage for all callbacks, repairs, parts, testing, labor and any other items necessary to
21 keep the elevator in like new condition until a minimum of twelve (12) maintenance examinations at approximately 30
22 day intervals have been completed.
- 23 C. It is stipulated that while the elevator contractor must start regular inspections upon substantial completion, the
24 inspections shall not accumulate towards the 12 months maintenance service period in paragraph A until elevator
25 contractor's completion of punch list and final acceptance of the elevator to the satisfaction of Consultant and Owner.
- 26 D. The preventive maintenance program shall include a scheduled inspection, cleaning, lubrication, adjustment, callbacks,
27 and repair or replacement of worn or defective parts. All work shall be performed by skilled, trained, and competent
28 employees of the elevator contractor and shall not be subcontracted. Contractor shall provide all material and labor,
29 and only original equipment manufacturer (OEM) parts shall be used.
- 30 E. This service shall not include adjustments, repairs or replacement of parts without charge due to negligence, misuse,
31 abuse or accidents caused by persons other than the elevator contractor or subcontractors. Hourly rate for billable
32 callbacks during the warranty period shall not exceed \$280/hr for regular time calls and \$500/hr for overtime calls.
33 Overtime calls that would otherwise be covered during regular working hours shall be billable for the premium portion
34 only.
- 35 F. Contractor shall provide a written record of work performed at the time of each visit and is solely responsible for all
36 maintenance records requirements of the elevator Code including the quarterly check and documentation of
37 Firefighters' Emergency Operation. Detailed maintenance records shall be kept in the service cabinet or other mutually
38 agreeable location and shall be available to the Owner at all times.
- 39 G. Maintain the elevator controls, hoistway, car top, pit, control room, and equipment located in these areas in clean
40 condition throughout the warranty and maintenance periods.
- 41 H. The elevator contractor shall respond on site within 2 hours of any request for service during regular working hours, and
42 within 30 minutes for entrapments during regular working hours. Response from time of call to mechanic arriving on
43 site shall not exceed 2 hours for overtime calls.
- 44 I. Prior to the completion of the 12 month warranty and maintenance period the elevator contractor shall perform the
45 Category 1 testing on each elevator and document their findings on the required testing forms and on a test tag per the
46 City of Madison. Copies of the test reports shall be kept in the on-site maintenance records.

47
48 **PART 2 – PRODUCTS**

49 **2.01 DESIGN AND SPECIFICATIONS**

- 50 A. Provide two hydraulic passenger elevators manufactured by:
51 1. Thyssenkrupp – Endura with Smartrise controls

- 1 2. Schumacher – GAL eHydro controls
- 2 3. Or approved equal
- 3 B. Specifically, the system shall consist of the following components:
- 4 1. A submersible hydraulic power unit and controller located in elevator machine room at lower landing.
- 5 2. Above ground hydraulic jacks
- 6 3. LED lighting in all ceiling lights and signal fixtures.
- 7 4. Automatic shutdown operation for LED ceiling lights and car fan during unoccupied periods (sleep mode).

8 **2.02 EQUIPMENT: CONTROLLER COMPONENTS**

- 9 A. A microprocessor-based control system shall be provided to perform all of the functions of safe elevator operation.
- 10 1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact
- 11 when the controller doors are open.
- 12 2. Provide control system utilizing on-board diagnostics for servicing, trouble-shooting, and adjusting without
- 13 requiring the use of an outside service tool. If an on-board diagnostic system is not provided, a handheld service
- 14 tool (or laptop computer), permanent owner’s license with terms acceptable to Owner, operation manual, and tool
- 15 instructions must be provided in addition to the control system. Any access code needed for on-board or service
- 16 tool diagnostics or adjusting shall be disclosed to Owner and elevator Consultant and shall not be subsequently
- 17 changed during or at the end of the one year warranty and service periods.
- 18 3. Controller shall be separated into two distinct parts; Motor Drive side and Control side. High voltage motor power
- 19 conductors shall be routed so as to be physically segregated from the rest of the controller.
- 20 4. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 volts AC,) and low
- 21 voltage (< 30 volts DC).
- 22 B. The elevator control system shall provide:
- 23 1. Inspection control devices in the main controller and on the car top to run the elevator on inspection operation.

24 **2.03 EQUIPMENT: DRIVING MEANS**

- 25 A. Elevator shall be driven by hydraulic means with above ground cylinders. Hydraulic power unit to be located in elevator
- 26 machine room at lower landing. Power units and controls shall be designed and sized to be located in machine room 11’
- 27 7” wide x 10’ 2” deep.
- 28 1. A new oil pumping and control mechanism shall be a compact submersible pump and motor type designed with
- 29 components in a self-contained steel tank with removable cover, factory assembled and painted with a baked
- 30 enamel or powder paint finish.
- 31 2. Pump assembly shall be direct coupling type designed and manufactured for submerged oil-hydraulic elevator
- 32 service; positive displacement, rotary screw type pump, non-pulsating and designed for elevator service. Output of
- 33 pump shall not vary more than 10% between no- load and full-load on the elevator car.
- 34 3. Submersible AC induction motor assembly shall be sized for the specified speed and duty and shall be designed for
- 35 oil-hydraulic elevator service. Motor shall be alternating current, squirrel cage induction type rated for 80 starts per
- 36 hour.
- 37 4. Control valve shall be housed inside power unit reservoir with removable cover and easily accessible from the top
- 38 of the tank. Adjustments shall be accessible, with adequate maintenance clearance provided.
- 39 5. Furnish and install power unit vibration isolation located under each corner of the power unit framework to isolate
- 40 power unit from concrete floor. The pump and motor shall also be mounted on reinforced isolation in the tank.
- 41 6. Furnish and install a hydraulic silencer inside the power unit, containing an effective noise suppression system in a
- 42 blowout proof housing located near the pump discharge.
- 43 7. Provide pressure switch to ensure compliance with A17.1 3.26.8.
- 44 8. Furnish and install all necessary hydraulic pressure piping to connect the hydraulic pumping unit in the elevator
- 45 machine to the hydraulic cylinders in the elevator hoistway. Grooved pipe fittings are acceptable provided they are
- 46 installed in locations that will permit the easy disassembly and inspection of all their component parts.
- 47 9. A minimum of one sound isolation coupling shall be installed in the machine room oil line isolated to minimize the
- 48 transmission of noise and vibration to the elevator car and lobbies.

10. Provide a new approved shutoff valve located adjacent to the power unit outlet. One additional shutoff valve shall be provided in the elevator pit adjacent to each hydraulic cylinder.
 11. Install new hydraulic oil (Hyd. ISO VG 32 150 SSU @ 100° F or otherwise, as recommended by control valve and pump manufacturer) in the new hydraulic reservoir, filling the new sufficiently to maintain an acceptable operating temperature. Document the hydraulic oil level in the maintenance record and the oil specification on a decal on the tank exterior.
 12. Provide a dipstick or sight gauge to monitor oil level without removing reservoir.
- C. Hydraulic Cylinder(s): Provide and install above ground hydraulic driving means meeting all applicable requirements of A17.1 3.18.
1. Hydraulic cylinders shall be marked with data tags per A17.1 3.18.6.
 2. After all hoistway construction and elevator equipment installation is completed install new hydraulic packings for each piston. Check exposed portions of piston for scrapes, dings or damage and make any necessary repairs to ensure smooth surface.
- D. Buffers, Car and Counterweight: Buffers shall be provided. Spring buffers or elastomeric buffers are acceptable.
- E. Hoistway Operating Devices:
1. Push to stop emergency stop switch in the pit located on the strike side of the elevator hoistway entrance adjacent to the pit ladder 18" above the landing sill.
 2. Terminal stopping switches.
- F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening. Guide rail brackets shall be positioned so that the guide shoes are within 18" of a guide rail bracket when the elevator is at any floor level.
- G. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway, where required by ASME A17.1.
- H. Pit Ladder: Steel access ladder furnished and installed by Elevator Contractor complying with elevator code requirements, including retractable ladder where required due to hoistway clearances. Where retractable ladders are provided, they shall be manufactured by Smart Elevator Tech, LLC or approved equal.
- I. Wiring: Wiring for all hoistway electrical devices included in scope of the elevator system, hall fixtures, pit emergency stop switch and traveling cable for the elevator car.
- J. Hoistway Entrances:
1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to support angles mounted in the hoistway and shall be of UL fire rated steel. Entrance frames shall be designed for extended depth. Verify and finalize wall depth and entrance frame size with architect and drawings.
 2. Sills: Aluminum with non-slip surfacing.
 3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements and flush furniture steel on front side, suitably reinforced and drilled to accept the door operator equipment.
 4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.
 5. Door and frame finish: Satin stainless steel.
 6. Sight guards: Provide on leading edge of hoistway door panels.
 7. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
 8. Provide Star of Life symbol on both sides of the elevator entrance frames at each landing.

2.04 EQUIPMENT: CAR COMPONENTS

- 1 A. Car Frame: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to
2 support the platform and car enclosures.
- 3 B. Cab: Steel shell cab with manufacturer’s premium selection of stainless steel applied panels.
- 4 C. Car Front Finish: Satin stainless steel columns, full width transom, return, and car door panels.
- 5 D. Car Top: All steel construction or wood material clad on both sides with a natural finish aluminum panel. Car top shall
6 have a concealed emergency exit and code compliant electrical contact
- 7 E. Ceiling Type: Rolled canopy ceiling with recessed lighting. All lighting shall be LED and provided with dimmable controls
8 on the car top.
- 9 F. Fan: A two-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 2016 code
10 requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a
11 baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.
- 12 G. Handrail: None to be provided.
- 13 H. Car Sill: Non-slip aluminum sills shall be provided in each elevator.
- 14 I. Guides: The car shall be provided with fixed guide shoes with replaceable pre-lubricated liners. Otherwise provide spring
15 tensioned roller guides at top and bottom.
- 16 J. Platform: The car platform shall be constructed of metal. A platform guard with a vertical length of at least 21” and
17 meeting all applicable requirements of A17.1 2016 2.15.9 shall be provided.
- 18 K. The LED ceiling lights and the fan shall automatically shut off when the system is not in use and be powered back up after
19 a passenger pushes a hall button to call the elevator.
- 20 L. Protective pad hooks and quilted fire retardant protective pads and hangars. Protective cab pads shall be provided for
21 each elevator and color selected by Owner during submittal review process. If clamp type hangars are used, they shall
22 securely hold the pads in place. Otherwise grommets and fixed pad buttons shall be provided.

23 **2.05 EQUIPMENT: SIGNAL DEVICES AND FIXTURES**

- 24 A. Signal Fixtures - General: Provide satin stainless steel coverplates. All call register pushbuttons, lanterns, emergency
25 light, car or hall lanterns, jewels, and other visual indicators shall have LED illumination. All pushbuttons shall be vandal
26 resistant round stainless steel buttons sufficiently durable, with illuminated call registration. All pushbuttons shall be
27 comparable to Innovation Industries “Bruiser” series with round projecting vandal resistant stainless steel call register
28 pushbuttons with counter-bored stop. Button type may be rejected during the warranty period should they fail to
29 withstand normal building use.
- 30 B. Car Operating Panel One main car operating panel shall be provided for the elevator. Car operating panel shall contain
31 all push buttons, key switches, and message indicators for elevator operation in a single satin stainless steel coverplate.
32 Car operating panel shall be equipped with the following features, unless other indicated below:
 - 33 1. Car Position Indicator at the top of and integral to the car operating panel.
 - 34 2. Emergency lighting shall be provided from the top of the panel.
 - 35 3. Replaceable stainless steel Elevator Data Plate marked with elevator capacity and Elevator number.
 - 36 4. Fire Cabinet with Firefighter’s Phase II switch keyed FEO-K1, visual and audible signals, call cancel button, toggle
37 stop switch, and Operating Instructions.
 - 38 5. Service cabinet with toggle switches for light, 2-speed fan, independent service, and keyed access enable. Service
39 cabinet shall be located at bottom of panel.
 - 40 6. Exposed in-car keyed stop switch.
 - 41 7. Illuminated call register floor pushbuttons.
 - 42 8. Non-illuminated door open and door close buttons.
 - 43 9. Alarm button, connected to a call bell that serves as an emergency signal, and which shall illuminate when
44 activated.
 - 45 10. Raised markings and Braille to the left side of each pushbutton.
 - 46 11. An integral ADA compliant communication device compatible with Owner’s VOIP communication system.
47 Emergency phone shall be installed in push to open recessed cabinet. A single button shall initiate two-way

1 communication between the car and Owner’s monitoring company with a secondary number programmed for the
2 elevator contractor’s emergency dispatch service. Visual indicators are provided for call initiation and call
3 acknowledgement, and system shall be designed to comply with ADAAG requirements. Necessary wiring for the
4 telephone shall be provided from the car to the elevator controller, including programming and testing.

5 12. Provide voice announcer for floor arrival.

6 C. Car Lanterns: Provide car directional lanterns in the elevator entrance indicating direction of elevator travel adjacent to
7 each elevator entrance at every landing. Fixtures shall be viewable from hall station locations.

8 D. Hall stations shall have round illuminated satin stainless steel pushbuttons in flush mount vertical stainless steel
9 coverplates. Up and down buttons shall be provided at the intermediate landings and a single call button at the terminal
10 landings. Hall stations shall utilize vandal-resistant fixtures. Hall stations shall be designed to incorporate ‘In Case of Fire’
11 pictograph.

12 Elevator Contractor to coordinate and provide assistance to install card reader security adjacent to the hall call
13 stations at each landing.

14 E. Provide separate fixture at designated landing containing the Emergency Power jewel, selector switch and
15 Communications Failure device. Location of fixture to be approved by Owner.

16 F. Keyed hoistway access switch at each terminal landing located within 12” of entrance. Access enable key switch in Car
17 Operating Panel shall utilize the same key as the fixtures located at the terminal landings.

18 G. Firefighters’ Key Box: A metal box shall be installed at the designated landing containing code required amount of FEO-
19 K1 key switches, a machine room door key, and hoistway door unlocking key. The box shall be keyed 52219 or 25460.

20 **2.06 EMERGENCY POWER OPERATION**

21 Each elevator shall be connected to run on emergency power as follows: When a signal from the building electrical system
22 indicates loss of normal electrical power, the elevator shall return to its Main Floor. Elevator shall cycle its doors and be
23 removed from normal service. One elevator at a time shall operate on the emergency generator.

24 All emergency power transfer switches that supply power to elevator equipment shall be capable of sending an Emergency
25 Power Signal to the elevator controller. This signal shall consist of a Form C contact that will change state and maintain its
26 state as long as the emergency power transfer switch has transferred to the emergency power source/generator.

27 All emergency power transfer switches that supply power to elevator equipment shall be capable of sending a Pre-Transfer
28 Warning Signal that precedes the operation of the emergency transfer switch. This signal shall be available for a live-buss-to-
29 live-buss transfer to emergency power and on transfer back to normal power. This signal shall precede transfer by a period of
30 time as recommended by the elevator installer. The time period shall generally range from 10 to 20 seconds. The Pre-
31 Transfer Warning Signal shall reset to normal when transfer takes place. The signal shall be available as a Form C contact.
32 This signal shall put the elevator in a special service mode. The special service mode will bring the elevator to the nearest
33 landing and open the doors. The special service mode will attempt to assure that the car is not in motion when the transfer
34 of power takes place. The Electrical Contractor shall provide this signal to the elevator equipment.

35 Elevator car lighting and ventilation shall operate on emergency generator power.

36 Control room HVAC shall operate on emergency generator power.

37

38 **PART 3 - EXECUTION**

39 **3.01 PREPARATION**

40 A. Take field dimensions and examine hoistway, supports, and other conditions under which this work is to be performed.
41 Adapt equipment to fit hoistway size shown on architectural drawings. Do not proceed with work until unsatisfactory
42 conditions are corrected.

43 B. Notify General Contractor in writing of material discrepancies or other conditions detrimental to performance of work
44 under this Section.

45 **3.02 INSTALLATION**

46 A. Installation of all elevator components except as specifically provided elsewhere by others.

47 B. All ferrous metals installed in the hoistway shall be painted with a rust inhibitive coating or be galvanized.

48 C. Install guide rails and all elevator components and accessories to provide a quiet, smoothly operating installation, free
49 from excessive deflection or vibration, pulsations, or noise.

- 1 D. A clear path shall be provided to all components or equipment that requires maintenance, of not less than 18 inches
2 clearance in the direction(s) required for maintenance access.
- 3 E. All field wiring required to perform work under this Section shall be provided in compliance with NFPA 70.
- 4 F. If required, field wiring and control interface between card reader and access control system provided by others in the
5 elevator control room is included by the elevator contractor.
- 6 G. Assist in testing of elevator emergency power operation, fire alarm initiating devices and recall operation prior to and at
7 time of inspection.
- 8 H. Protect equipment and exposed finishes from damage during installation.
- 9 I. Make adjustments to elevator system to ensure acceptable elevator operation, and to comply with Section 1.04
10 Performance Requirements.

11 **3.03 PRODUCT DELIVERY, CLEANUP**

- 12 A. Contractor shall take precautions to secure the elevator hoistway during installation.
- 13 B. Deliver materials in original, unopened protective packaging. Provide protective coverings, barriers, etc. to protect
14 equipment and finishes from damage during transportation, storage, and construction. Temporary storage of materials
15 must be arranged with General Contractor.
- 16 C. Contractor shall keep work areas orderly and free from debris during the course of installation and clean up on a daily
17 basis. If areas are not kept clean, the General Contractor may clean those areas and deduct cost from contract.
- 18 D. The car top, hoistway, control room, pit, and equipment located therein shall be thoroughly cleaned at the time of
19 acceptance and shall be cleaned to Owner's satisfaction at the end of the one year warranty and maintenance periods.
20 Hoistway cleaning shall include guide rails and rail brackets, platform apron and fascia, door panels, hangars, headers,
21 and hoistway sills. Final cleaning of work, as applicable, shall include but not be limited to following:
 - 22 1. Clean surfaces exposed to view; remove protective covering and clean surfaces at completion.
 - 23 2. Clean finishes free of dust, lint, stains, films, adhesives and other foreign substances. Remove excess lubrication.
 - 24 3. Remove construction debris trash, materials, cartons, etc. from the premises.
 - 25 4. Touch up or otherwise restore damaged factory-painted or exposed finishes and surfaces with original paint and
26 color as required.
 - 27 5. Replace new or existing finishes and surfaces that cannot be repaired or restored to the Owner's satisfaction.

28 **3.04 DEMONSTRATION AND ACCEPTANCE**

- 29 A. The elevator contractor shall make all acceptance or other tests required by the governing codes and advise Owner and
30 Architect in advance of date and time acceptance tests are to be performed.
- 31 B. Provide electronic copy of O&M documents to A/E and consultant for review within 30 days of the completion and
32 turnover of the first elevator.
- 33 C. Demonstrate the operation of the elevator system to the Owner and Architect upon completion of installation and prior
34 to final acceptance, including:
 - 35 1. Installation compliance with specifications.
 - 36 2. Conduct a running speed test with full load, checking starting, accelerating, deceleration, stopping g-forces, jerk,
37 stopping accuracy, car ride and floor-to-floor performance times.
 - 38 3. Operation of signal fixtures.
 - 39 4. Door operation, closing force, opening and closing times as specified.
 - 40 5. Firefighters' Emergency Operation
 - 41 6. Emergency Power Operation
 - 42 7. Promptly remove all work rejected by Architect or Owner for failure to meet specifications and replace to comply
43 with requirements, at no additional cost to the Owner.
 - 44 8. Rejected work which is not made good within a reasonable time, determined by the Owner, may be corrected by
45 the Owner at Contractor's expense.
- 46 D. The elevator contractor shall demonstrate to Owner's satisfaction that control systems and all system devices are
47 functioning properly and meet Section 1.04 Performance Requirements.

- 1 E. The elevator contractor shall instruct Owner’s personnel in the proper use and operation of the elevator with the Owner
2 or Owner’s representative present prior to turning the elevator over for use. Review and demonstrate procedures,
3 including Firefighters’ Emergency Operation and Emergency Power Operation. Such training shall include a
4 familiarization with the elevator equipment, conducted by Elevator Contractor for a group of Owner’s employees on one
5 occasion. Up to 2 hours of training shall be included by Elevator Contractor. Owner may choose to video record training
6 sessions at their discretion. Training shall be after all of the elevator O&M manuals have been submitted.
- 7 F. Work shall not be considered complete until accepted in writing by Owner, and then only after successful completion of
8 all violations cited by the City of Madison inspector, and completion of Consultant and Architect’s punch lists.
9

10

11

END OF SECTION