JUDGE DOYLE SQUARE
PUBLIC PARKING FACILITY
BLOCK 88 – PODIUM

FOR

THE CITY OF MADISON, WISCONSIN

ISSUED FOR PODIUM BID

VOLUME I (Divisions 00 through 14)

December 7, 2018

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PARKING CONSULTANTS

STRUCTURAL ENGINEERS:
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A WSP | PARSONS BRINCKERHOFF COMPANY

MEP/FP ENGINEERS:
AEI Affiliated Engineers

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LANDSCAPE ARCHITECT:
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PLANNING
LANDSCAPE ARCHITECTURE
URBAN DESIGN

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PART 1 – GENERAL

1.1 SUMMARY

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

1.2 REFERENCES

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

1.3 GENERAL CONTRACTOR REQUIREMENTS

A. The GC shall be responsible for all of the following:
    1. Execute application for all required permits as may be required by the scope of work described within the contract documents.
    2. Paying all fees associated with the application of any required permits.
    3. Scheduling all required inspections that may be conditions of any required permits.
B. The GC shall provide high quality scanned images of all required permits and inspections and upload them to the Contract Documents-Regulatory Documents Library on the Project Management Web Site.

PART 2 – PRODUCTS – THIS SECTION NOT USED

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	4.	P-100.2	PLUMBING UNDERGROUND PARKING PLAN - LEVEL U3
	5.	P-100.3	PLUMBING UNDERGROUND PARKING PLAN - LEVEL U2
	6.	P-100.4	PLUMBING UNDERGROUND PARKING PLAN - U1
	7.	P-100.5	PLUMBING UNDERGROUND PARKING PLAN - LEVEL U0
	8.	P-101.0	PLUMBING LEVEL 1 PLAN - WILSON STREET
	9.	P-102.0	PLUMBING LEVEL 2 PLAN - DOTY STREET
	10.	P-103.0	PLUMBING LEVEL 3 PLAN
	11.	P-104.0	PLUMBING LEVEL 4 PLAN
	12.	P-105.0	PLUMBING LEVEL 5 PLAN
	13.	P-400.0	PLUMBING ENLARGED VIEWS
	14.	P-500.0	PLUMBING DETAILS AND SCHEDULES
	15.	P-700.0	DOMESTIC WATER ISOMETRIC DIAGRAM
	16.	P-701.0	SANITARY WASTE & VENT ISOMETRIC DIAGRAM
	17.	P-702.0	CLEARWATER WASTE AND VENT ISOMETRIC DIAGRAM
H.	ELECTRICAL		
	1.	E-000.0	ELECTRICAL SYMBOLS & ABBREVIATIONS
	2.	E-001.0	ELECTRICAL SITE PLAN
	3.	E-100.1	LIGHTING UNDERGROUND PARKING PLAN - LEVEL U4
	4.	E-100.2	LIGHTING UNDERGROUND PARKING PLAN - LEVEL U3
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	6.	E-100.4	LIGHTING UNDERGROUND PARKING PLAN - LEVEL U1
	7.	E-100.5	LIGHTING UNDERGROUND PARKING PLAN - LEVEL U0
	8.	E-101.0	LIGHTING LEVEL 1 PLAN - WILSON STREET
	9.	E-102.0	LIGHTING LEVEL 2 PLAN - DOTY STREET
	10.	E-103.0	LIGHTING LEVEL 3 PLAN
	11.	E-104.0	LIGHTING LEVEL 4 PLAN
	12.	E-110.1	POWER UNDERGROUND PARKING PLAN - LEVEL U4
	13.	E-110.2	POWER UNDERGROUND PARKING PLAN - LEVEL U3
	14.	E-110.3	POWER UNDERGROUND PARKING PLAN - LEVEL U2
	15.	E-110.4	POWER UNDERGROUND PARKING PLAN - LEVEL U1
	16.	E-110.5	POWER UNDERGROUND PARKING PLAN - LEVEL U0
	17.	E-111.0	POWER LEVEL 1 PLAN - WILSON STREET
	18.	E-112.0	POWER LEVEL 2 PLAN - DOTY STREET
	19.	E-113.0	POWER LEVEL 3 PLAN
	20.	E-114.0	POWER LEVEL 4 PLAN
	21.	E-120.1	SYSTEMS UNDERGROUND PARKING PLAN - LEVEL U4
	22.	E-120.2	SYSTEMS UNDERGROUND PARKING PLAN - LEVEL U3
	23.	E-120.3	SYSTEMS UNDERGROUND PARKING PLAN - LEVEL U2
	24.	E-120.4	SYSTEMS UNDERGROUND PARKING PLAN - LEVEL U1
	25.	E-120.5	SYSTEMS UNDERGROUND PARKING PLAN - LEVEL U0
	26.	E-121.0	SYSTEMS LEVEL 1 PLAN - WILSON STREET
	27.	E-122.0	SYSTEMS LEVEL 2 PLAN - DOTY STREET
	28.	E-400.0	ELECTRICAL ENLARGED VIEWS
	29.	E-401.0	TECHNOLOGY ENLARGED VIEWS
	30.	E-500.0	ELECTRICAL DETAILS
	31.	E-501.0	ELECTRICAL DETAILS
	32.	E-600.0	ELECTRICAL WIRING SCHEDULES
	33.	E-601.0	LUMINAIRE SCHEDULE
	34.	E-602.0	EQUIPMENT SCHEDULE
	35.	E-603.0	ELECTRICAL PANEL SCHEDULES
	36.	E-604.0	ELECTRICAL PANEL SCHEDULES
	37.	E-605.0	ELECTRICAL PANEL SCHEDULES
	38.	E-700.0	ELECTRICAL RISER DIAGRAM
	39.	E-701.0	GROUNDING RISER DIAGRAM
	40.	E-702.0	FIRE ALARM RISER DIAGRAM AND MATRIX
I.	SECURITY		
	1.	T-001.0	NOTES, SYMBOLS, & ABBREVIATIONS

2. T-122.0 LEVEL 2 PLAN - DOTY ST. ENTRY - SECURITY
3. T-123.0 LEVEL 3 PLAN - PARKING PLAN - SECURITY
4. T-124.0 LEVEL 4 PLAN - PARKING PLAN - SECURITY
5. T-401.0 ENLARGED PLANS
6. T-402.0 ENLARGED PLAN - BICYCLE CENTER
7. T-501.0 DETAILS
8. T-601.0 SCHEDULES
9. T-701.0 ONE-LINE DIAGRAMS

J. FIRE PROTECTION

1. F-000.0 FIRE PROTECTION SYMBOLS & ABBREVIATIONS
2. F-100.1 FIRE PROTECTION UNDERGROUND PARKING PLAN - LEVEL U4
3. F-100.2 FIRE PROTECTION UNDERGROUND PARKING PLAN - LEVEL U3
4. F-100.3 FIRE PROTECTION UNDERGROUND PARKING PLAN - LEVEL U2
5. F-100.4 FIRE PROTECTION UNDERGROUND PARKING PLAN - LEVEL U1
6. F-100.5 FIRE PROTECTION UNDERGROUND PARKING PLAN - LEVEL U0
7. F-101.0 FIRE PROTECTION LEVEL 1 PLAN - WILSON STREET ENTRANCE
8. F-102.0 FIRE PROTECTION LEVEL 2 PLAN - DOTY STREET ENTRANCE
9. F-500.0 FIRE PROTECTION DETAILS
10. F-700.0 FIRE PROTECTION DIAGRAM

K. PARKING

1. PA-100.1 UNDERGROUND PARKING PLAN - LEVEL U4
2. PA-100.2 UNDERGROUND PARKING PLAN - LEVEL U3
3. PA-100.3 UNDERGROUND PARKING PLAN - LEVEL U2
4. PA-100.4 UNDERGROUND PARKING PLAN - LEVEL U1
5. PA-100.5 UNDERGROUND PARKING PLAN - LEVEL U0
6. PA-101.0 LEVEL 1 PARKING PLAN - WILSON STREET ENTRANCE
7. PA-102.0 LEVEL 2 PARKING PLAN - DOTY STREET ENTRANCE
8. PA-103.0 APARTMENT PARKING PLAN - LEVEL 3
9. PA-104.0 APARTMENT PARKING PLAN - LEVEL 4
10. PA-401.0 ENLARGED PLANS
11. PA-601.0 SIGN SCHEDULE AND COMPONENTS
12. PA-701.0 SIGN MOUNTING DETAILS

3.1 LIST OF SPECIFICATIONS ISSUED FOR BID (12/7/2018)

A. (See Project Manual, Table of Contents)

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 – GENERAL

1.1 SUMMARY

A. This 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 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. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify 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. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Submit a price for each of the scheduled Alternates. Alternates may require the work of more than one trade. Coordinate prices to include all costs so that no additional costs is borne by the Owner due to the acceptance of additive or deductive alternates.

E. All additional costs due to the inclusion of Alternates is to be included in the amount to be added to the Contract Sum, including, without limitation, all labor, materials, equipment, supervision, taxes, permits, fees, overhead and profit, so that no additional costs will be borne by the Owner due to the inclusion of the additive or deductive Alternates.

F. Schedule: A Schedule of Alternates 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 – THIS SECTION NOT USED

PART 3 – EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. General Construction:

1. Alternate G-1: State the amount to be deducted from the Contract Sum for deleting ***the build-out of the Bicycle Center*** as shown on the Drawings (A-600 Series and corresponding Mechanical, Plumbing, Electrical, and Fire Protection Drawings).
2. Alternate G-2: State the amount to be deducted from the Contract Sum for deleting ***the roofing, roof insulation, parapets, copings, stair enclosure penthouse, etc. at Level-5 and -6*** as shown on the Drawings (A-105, A-106, and related details, plus all related Mechanical, Plumbing, Electrical, and Fire Protection Drawings).
3. Alternate G-3: State the amount to be deducted from the Contract Sum for deleting ***the expansion of the Emergency Responder Radio System*** as noted on drawings and as shown on Drawings E-122.1, E-123.1, E-123.1, and Specification 27 53 19.

END OF SECTION

SECTION 01 25 13
PRODUCT SUBSTITUTION PROCEDURES

PART 1 – GENERAL

1.1. SUMMARY

A. The City of Madison uses a specific list of preferred products for various specification items to establish standards of quality, utility, and appearance required.

B. The City of Madison will not allow substitutions for specified Products except as follows:
   1. The Product is no longer produced or the product manufacturer is no longer in business.
   2. The manufacturer has significantly changed performance data, product dimensions, or other such design criteria for the specified Product(s).
   3. Products specified by naming one or more Products or manufacturer's and "or approved equal" or "approved equivalent."

C. The City of Madison will not allow substitutions for specified Products as follows:
   1. For Products specified by naming only one Product and manufacturer, no substitute product will be considered.
   2. For Products specified by naming several Products or manufacturers select any one of the products or manufacturers named, which complies with the specifications. No substitute product will be considered.

D. Request for substitutions from any party other than the General Contractor (GC) will not be accepted.

1.2. RELATED SPECIFICATIONS

A. Section 01 26 13 Request for Information (RFI)
B. Section 01 31 23 Project Management Web Site
C. Section 01 33 23 Submittals

PART 2 – PRODUCTS

2.1. SUBSTITUTION REQUEST FORM

A. During bidding all contractors (General and Sub-contractors) and suppliers of materials or products shall provide hard copy of the Substitution Request form and all required attachments directly to the Project Architect.
   1. Contractors and suppliers shall use the screen shot of the form located at the end of this specification to print a hard copy for all pre-bid substitution requests.

B. After bidding only the GC shall submit a request and shall use the form located on the Project Management Web Site.

PART 3 - EXECUTION

3.1. REQUESTING A SUBSTITUTION DURING BIDDING

A. In the event that a substitution is requested during the bidding phase the Contractor or Supplier shall meet the substitution request deadline listed in the bidding documents. No substitution request will be considered during the bidding period after the stated substitution request deadline. In general this procedure shall be as follows:
   1. Submit a Substitution Request Form for each different product
   2. Support your request with complete data, drawings, specifications, performance data and samples as appropriate. A complete submission shall include the following:
      i. Substitution Request Form as a cover sheet
      ii Comparison of qualities of the proposed substitutions with that specified.
      iii. Changes required in other elements of the Work because of the substitution.

iv. Effect on the construction schedule.
v. Cost data comparing the proposed substitution with the Product specified.
vi. Any required license fees or royalties.
vii. Availability of maintenance service and source of replacement materials.

3. Submit the Substitution Request Form and all required supporting documentation to the City Project Manager and Project Architect.
   i. Submissions to be done as complete PDF files for each product, appropriately titled
   ii. Email submissions to the Project Architect and City Project Manager at the email addresses provided on the last page of Section D of the contract documents.
   iii. Submissions must be received by the substitution request deadline specified in Section A of the Contract Documents.

B. Substitutions submitted and approved during the bidding phase shall be announced by the City of Madison by addenda prior to the bid due date.

C. The Owner and Architect may reject any substitution request without providing specific reasons.

3.2. REQUESTING A SUBSTITUTION AFTER AWARD OF CONTRACT

A. A substitution request will only be considered after award of contract if it meets the qualifying provisions as described in 1.1.B.1 and .2 above.

B. The GC shall submit a substitution request using the digital form on the Project Management Web Site located in the Construction Administration-Substitution Request library.
   1. Click on *Add document* to open a new digital form, fill out form, provide required attachments, then click the Submit button.
   2. 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.

Substitution Request

Today's Date:

Project Title:

Project Number: *Contract Number:*

By completing and submitting this form for review the General Contractor affirms that all of the following statements are correct:

1. The General Contractor affirms that this request is in compliance with the requirements described in ***Specification 01 25 13 Product Substitution Procedures***.
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:

Related Specification:

Reason for Substitution:

Proposed Substitution:
(include Name, Model, etc.)

Submitted By: *Phone:*

Company: *Email:*

2
3
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END OF SECTION

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SECTION 01 26 13
REQUEST FOR INFORMATION (RFI)

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 Construction Administration-Request for Information Library on 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 PA 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 PA 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. The GC, PA, or CPM as appropriate shall click the link in the left margin of the project web site opening a new form. Project information is pre-loaded, provide additional information as indicated below in the execution to complete the form.

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 select the "Submit an RFI" link on the Project Management Web Site and completely fill out the form as follows:

1. Contract related information will be automatically populated on the form.
2. Thoroughly explain the issue at hand, provide backup information (photographs, sketches, drawings, data, etc) as necessary, and clearly state the question or problem that requires a resolution. Combine like or related issues but do not include multiple issues on one form.
    a. Example. If a duct interferes with other critical piping and electrical work include all issues into one RFI.
    b. Example. If you have a question regarding the chiller and another regarding toilet partitions create separate RFIs.
3. Check all relevant boxes for trades affected. This will assist the design team in determining who should be reviewing the RFI.

C. Upon completing the RFI click the "Submit" button. The PMWS software will automatically route the RFI to the appropriate reviewers.

3.3. RFI RESPONSES

A. Responses to simple RFI issues shall use the response section of the RFI form and shall be completed within five (5) working days of the RFI form being submitted.

B. Responses to more complex issues may require additional time or may require a Construction Bulletin to be published. The initial RFI shall be responded to within five (5) working days stating that the RFI is being reviewed and provide an estimated date for the response.

C. The following GC generated RFIs will be returned without action:

1. Requests for approval of submittals
2. Requests for approval of substitutions
3. Requests for approval of Contractor's means and methods.
4. Requests for coordination information already indicated in the Contract Documents.
5. Requests for adjustments in the Contract Time or the Contract Sum.
6. Requests for interpretation of A/E's actions on submittals.
7. Incomplete RFI or inaccurately prepared RFI.

3.4. COMMENCEMENT OF WORK RELATED TO AN RFI

A. The GC shall only proceed with the Work of an RFI when additional information is not required.

B. The GC shall not proceed with any Work associated with an RFI while it is under review.

C. The GC shall not proceed with any Work associated with an RFI that clearly states a CB will be issued in response to the RFI.

D. The GC will be required to immediately remove and replace unauthorized Work and all costs required to conform to the Contract Documents shall be borne by the GC.

END OF SECTION

SECTION 01 26 46
CONSTRUCTION BULLETIN (CB)

PART 1 – GENERAL

1.1. SUMMARY

A. Construction Bulletins (CB) are formal published construction documents that modify the original contract bid documents after construction has commenced. CBs may be published for many reasons, including but not limited to the following:
   1. Clarification of existing construction documents including specifications, plans, and details
   2. Change in product or equipment
   3. A response to a Request for Information
   4. Change in scope of the contract as either an add or a deduct of work

B. CBs provide a higher degree of detail in response to a Request for Information (RFI) through directives, revised plans/details, and specifications as necessary.

C. The CB may change the original contract documents through additions or deletions to the Work.

D. Where the directives of a CB are significant enough to warrant a Change Order Request (COR) the GC shall use all information provided in the CB to assemble all required back-up documentation for additions and deletions of materials, labor and other related contract costs for the COR.

E. All CB documentation will be processed through the Construction Administration-Construction Bulletin Library on the Project Management Web Site (PMWS).

1.2. RELATED SPECIFICATIONS

A. Section 01 26 13 Request for Information (RFI)
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
E. Section 01 91 00 Commissioning

1.3. PERFORMANCE REQUIREMENTS

A. Project Architect (PA): The PA shall be the only person authorized to publish a CB as needed for any reason indicated in section 1.1.A above. The PA shall consult as necessary with any of the following while drafting the CB and shall confirm final direction with the CPM prior to issuing a CB:
   1. City Project manager (CPM)
   2. Owner
   3. Members of the consulting staff
   4. Members of city staff
   5. The General Contractor
   6. Sub-contractors
   7. Commissioning Agent (CxA)

B. General Contractor: The GC shall be responsible for the following as needed:
   1. Executing the directives of the CB when he/she believes that no changes in labor, materials, equipment, or contract duration will be required for additions or deletions.
   2. Submit a COR when he/she believes that a change in labor, materials, equipment or contract duration will be required for additions or deletions.

1.4. QUALITY ASSURANCE

A. The PA shall be responsible for ensuring the final CB sufficiently provides direction, details, specifications and other information as necessary for the GC to perform the intended Work.

B. The PA shall be responsible for ensuring the final CB is published as expeditiously as practical based on the complexity of the CB being written. CBs that may affect the GC critical path shall be given priority.

PART 2 – PRODUCTS

2.1. CONSTRUCTION BULLETIN FORM

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

PART 3 - EXECUTION

3.1. WRITING THE CONSTRUCTION BULLETIN

A. The PA shall draft a CB as needed using the Construction Bulletin form on the Project Management Web Site.

1. The PA and/or consulting staff as necessary shall provide specifications, model numbers and performance data, details and other such information necessary to clearly state the intentions of the CB.
2. The consulting staff, CPM, Owner, CxA and other City Staff shall review the draft and recommend changes as needed.
3. The PA shall amend the draft as necessary into a final CB for review

B. Once the final CB has been approved the PA shall “Submit” the CB through the Project Management Web Site to the GC.

3.2. EXECUTING THE CONSTRUCTION BULLETIN

A. The GC shall acknowledge receipt of the CB on the Project Management Web Site as instructed in the Tutorial Manual provided to the awarded contractor.

B. The GC shall notify all Sub-contractors of the CB and publish the CB to all field sets of drawings and specifications as appropriate.

C. The GC shall execute the directives of the CB or submit COR documentation as necessary during the execution and implementation of the CB.

1. See Specification 01 26 57 Change Order Request (COR)

END OF SECTION

SECTION 01 26 57
CHANGE ORDER REQUESTS (COR)

PART 1 – GENERAL

1.1. SUMMARY

A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made by the General Contractor (GC) without having prior approval of the City Engineer or his representative.

B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in the Work by written Change Order (CO). Such changes may include additions and/or deletions.

C. Where the City desires to make changes in the Work through use of written Change Order Request (COR), the following procedures apply:

1. If requested by the City, the GC shall prepare and submit a detailed proposal, including all cost and time adjustments to which the GC believes it will be entitled if the change proposed is incorporated into the Contract. The City shall be under no legal obligation to issue a Change Order for such proposal.
2. The parties shall attempt in good faith to reach agreement on the adjustments needed to the Contract to properly incorporate the proposed change(s) into the Work. In the event that the parties agree on such adjustments, the City may issue a Change Order and incorporate such changes and agreed to adjustments, if any.
3. In some instances, it may be necessary for the City to authorize Work or direct changes in Work for which no final and binding agreement has been reached and for which unit prices are not applicable. In such cases the following shall apply.
    a. Upon written request by the City, the GC shall perform proposed Work
    b. The cost of such change may be determined in accordance with this specification.
    c. In the event agreement cannot be accomplished as contemplated herein, the City may authorize the Work to be performed by City forces or to hire others to complete the Work. Such action on the part of the City shall not be the basis of a claim by the GC for failure to allow it to perform the changed Work.

D. Where changes in the Work are made by the City through use of a force account basis, the GC shall as soon as practicable, and in no case later than ten (10) working days from the receipt of such order, unless another time period has been agreed to by both parties, give the City written Notice, stating:

1. The date, circumstances and source of the extra work; and,
2. The cost of performing extra work described by such Order, if any; and,
3. Effect of the order on the required completion date of the Project, if any.

E. The giving of each Notice by the GC as prescribed by this specification, shall be a requirement to liability of the City for payment of any additional costs incurred by the GC in implementing changes in the Work. Under this specification, no order or statement of the City shall be treated as a Change Order, or shall entitle the GC to an equitable adjustment of the terms of this Contract or damages for costs incurred by the GC on any activity for which the Notice was not given.

F. In the event Work is required due to an emergency as described in this specification the GC must request an equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the commencement of such emergency.

G. All GC requests for equitable adjustment shall be submitted to the CPM per the specifications below. Such requests shall set forth with specificity the amount of and reason(s) for the proposed adjustment and shall be accompanied by supporting information and documents.

H. No adjustment of any kind shall be made to this Contract, if asserted by the GC for the first time, after the date of final payment.

I. This specification shall be used by the GC when preparing documentation for any COR to ensure each has been properly and completely filled out as required by the City of Madison.

J. All COR documentation will be processed through the Construction Administration-Change Order Request Library on the Project Management Web Site (PMWS).

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 26 13 Request for Information (RFI)
B. Section 01 26 46 Construction Bulletins (CB)
C. Section 01 26 63 Change Order (CO)
D. Section 01 31 23 Project Management Web Site
E. Section 01 91 00 Commissioning

F. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public Works Construction".

1. Use the following link to access the Standard 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 Standard Specification **2**10.2" 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. DEFINITIONS AND STANDARDS

A. LABOR: The amount of time and cost associated with the performance of human effort for a defined scope of Work. Labor is further defined as follows:
   1. Labor rate is the total hourly rate which includes the basic rate of pay, fringe benefits plus each company's cost of required insurance, also referred to as a reimbursable labor rate.
   2. Unit labor is the labor hours anticipated to install the corresponding unit of material.
   3. Labor cost is the labor hours multiplied by the hourly labor rates.

B. MATERIAL: Actual material cost is the amount paid, or to be paid, by the GC for materials, supplies and equipment entering permanently into the Work, including cost of transportation and applicable taxes. The cost shall not exceed the usual and customary cost for such items available in the geographical area of the project

C. LARGE TOOLS AND MAJOR EQUIPMENT: Large tools and major equipment are those with an initial cost greater than $1,500, whether from the GC or other sources.
   1. Tool and equipment use and time allowed is only for extra work associated with change orders.
      a. Rental Rate is the machine cost associated with operating a piece of equipment for a defined length of time (hour, day, week, or month) and shall not exceed the usual and customary amount for such items available in the geographical area of the project.
      b. Rental cost is the rental rate multiplied by the anticipated duration the equipment shall be required.
   2. The GC shall provide a breakdown of all rental rates to indicate what items and costs are associated with the rate. Examples of items to include in the breakdown would be fuel consumption, lubrication, maintenance and other similar expenses but not including profit and overhead.
   3. When large tools and equipment needed for Change Order work are not already at the job site, the actual cost to get the item there is also reimbursable.

D. BOND COST: The cost shall be calculated at 1% of the total proposed change order.

E. SUB-CONTRACTOR COSTS: Sub-contractor costs are for those labor, material, and equipment costs required by subcontracted specialties to complete the Change Order work.

F. OVERHEAD AND PROFIT Markup: The allowable markup percentage to a COR by the GC and Sub-contractors for overhead and profit. All of the following are expenses associated with overhead and profit and shall not be reimbursable as individual items on any COR:
   1. CHANGE ORDER PREPARATION: All costs associated with the preparing and processing of the change order.

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

G. Contract Extension: The necessary amount of time to be added to the contract deadlines for the completion of a change order.

1.4. CONTRACT EXTENSION

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

1.5. OVERHEAD AND PROFIT MARKUP

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

1.6. PERFORMANCE REQUIREMENTS

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

1.7. QUALITY ASSURANCE

A. The GC shall be responsible for ensuring that all COR supporting documentation meets the following requirements prior to completing the COR form on the Project Management Web Site:
   1. Sufficiently indicates labor, material, and other expenses related to completing the intent of the CB.
   2. No costs exceed the usual and customary amount for such items available in the geographical area of the project, and no costs exceed those established under the contract.

B. The Project Architect (PA), Commissioning Agent (CxA), City Project Manager (CPM), other members of the consulting staff, and city staff shall review all COR requests to ensure that the intent of the CB will be met under the proposal of the COR or request additional information as necessary.

PART 2 – PRODUCTS

2.1. CHANGE ORDER REQUEST FORM

A. The COR form is located on the Project Management Web Site. The GC shall click the link in the left margin of the project web site opening a new form. Follow additional instructions below in the execution section for filling out the form.

PART 3 - EXECUTION

3.1. ESTABLISHING A CHANGE ORDER REQUEST

A. Upon receipt of a Construction Bulletin (CB) where the GC believes a significant change in contract scope warrants the submittal of a COR the GC shall do all of the following within ten (10) working days after receipt of the CB:
   1. Review the CB with all necessary trades and sub-contractors required by the change in scope.
      a. Additions or deletions to the contract scope shall be as directed within the CB.
      b. Additions or deletions of labor and materials shall be determined by the GC based on the directives of the CB.
   2. Assemble all required back-up documentation for additions and deletions of materials, labor and other related contract costs as previously outlined in this specification.
   3. Submit a COR request form on the Project Management Web Site.

B. Submitting a COR does not obligate the GC to complete the work associated with the COR nor does it obligate the Owner to approve the COR as a change to the contract.

3.2. SUBMIT A CHANGE ORDER REQUEST FORM

A. This specification shall provide a subject overview only. In depth instructions shall be provided to the awarded Contractor in a PDF Instructional Manual.

B. The GC shall select the “Submit a COR” link on the Project Management Web Site.

C. The software will open a new COR form and the GC shall provide all of the following information:
   1. DO NOT perform any calculations on this worksheet, only provide the raw data as requested below. All calculations, totals, and markups shall be computed as described within this specification.
   2. Provide a summary description of the COR request, and justification for any requested time extension to the contract, indicate the number of calendar days being requested for the extension and add any attachments to the form as needed.
   3. Provide all GC self performance data including all of the following:
      a. Materials description, quantities, and unit costs.
      b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
      c. Equipment descriptions, quantities, unit costs and rates.
   4. Provide all Sub-contractor data including all of the following:
      a. Materials description, quantities, and unit costs.
      b. Labor hours and rates for all Foremen, Journeymen, and Apprentices by trade.
      c. Equipment descriptions, quantities, unit costs and rates.
   5. Ensure all calculations performed by the form have been completed correctly. Contact the CPM directly if you suspect an error before hitting the save button.

C. At any time after creating a COR you must at a minimum click “Save as Draft” to save your work.

D. When all data has been entered and verified click on the “Submit COR” button. This will kick off the COR Review and Approval process.

3.3. CHANGE ORDER REQUEST REVIEW, APPROVAL, AND PROCESSING

A. The PA and CPM shall review all CORs submitted by the GC.
   1. Additional consulting staff and city staff having knowledge of the components of the COR shall review and advise the PA and CPM as to the accuracy of the items, quantities, and associated costs of the COR as directed by the CB.
   2. The CPM shall review the COR with the Owner.

B. If required the PA and CPM, shall in good faith, further negotiate the COR with the GC as necessary. All amendments to any COR shall be documented within the Project Management Web Site software.

C. After final review of the COR the CPM and Owner may accept the COR.

D. The CPM shall prepare the COR in the form of an official Board of Public Works Change Order for final review and approval as outlined in Section 01 26 63 Change Order (CO).

E. The GC shall not act upon any accepted COR until it has received final approval through the Public Works process as an official CO to the Work unless instructed to do so by the CPM. Proceeding without the final approval of a fully authorized Change Order is at the GC's own risk.

3.4. EMERGENCY CHANGE ORDER REQUEST

A. In the event Work is required due to an emergency as described in the Contract Documents, the GC must request an equitable adjustment as soon as practicable, and in no case later than ten (10) working days of the commencement of such emergency.

B. The GC shall provide full documentation of all labor, materials and equipment used during the period of emergency as part of the COR submittal.

END OF SECTION

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SECTION 01 26 63
CHANGE ORDER (CO)

PART 1 – GENERAL

1.1. SUMMARY

A. Except in cases of emergency, no changes in the Work required by the Contract Documents may be made by the General Contractor (GC) without having prior approval of the City Project Manager (CPM).

B. The City may at any time, without invalidating the Contract and without Notice to Sureties, order changes in the Work by written Change Order. Such changes may include additions and/or deletions.

C. The Change Order (CO) is a Board of Public Works (BPW) form that is reviewed and approved by a specific process.

D. The CO form is typically made up of multiple Change Order Requests (CORs) and/or Bid Items as appropriate depending on the type of project and how the contract was bid.

E. All CO documentation shall be processed through the Construction Administration-Change Order Library and digital workflow on the Project Management Web Site (PMWS).

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. BOARD OF PUBLIC WORKS PROCEDURE

A. The Board of Public Works has a very explicit procedure for the review and approval of all change orders associated with any Public Works Contract as follows:
   1. The Supervisory Chain of the CPM shall review and approve any CO under $10,000 provided it does not include either of the following:
      a. The CO does not request a time extension to the contract.
      b. The CO does not cause the contract contingency sum to be exceeded.
   2. The Board of Public Works shall review and approve any CO that requires any of the following:
      a. Any CO over $10,000.
      b. Any CO requesting a time extension to the contract regardless of the monetary value of the CO.
      c. Any CO that that causes the contract contingency sum to be exceeded.

B. The Board of Public Works generally meets every other week and only once in August and December. The GC is cautioned that, under normal scheduling, a CO requiring a BPW review will take a minimum of two (2) weeks to achieve final approval.
   1. The City shall not be responsible for additional delays to the Work caused by the scheduling constraints of the Board of Public Works.

C. *SPECIAL NOTE:* The GC is cautioned to never proceed unless told to do so by the CPM. Only in rare instances may the CPM give a written notice to proceed on a COR without an approved CO. Proceeding without the written notice of the CPM or an approved CO is at the GC's own risk.

PART 2 – PRODUCTS

2.1. CHANGE ORDER FORM

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

PART 3 - EXECUTION

3.1. PREPARATION OF THE CHANGE ORDER

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

3.2. EXECUTION OF THE CHANGE ORDER

A. Upon saving the CO as described in section 3.1 above the software associated with the Project Management Web Site shall notify the GC that the CO has been drafted and is ready for review. The GC shall do the following:
   1. Open the appropriate CO form in the Construction Administration-Change Order Library and review all items on the form.
   2. The GC shall notify the CPM immediately of any errors or discrepancies on the form and shall not sign or save it.
      a. The CPM shall make any corrections as needed, re-save the form, and notify the GC.
   3. If/when the GC concurs with the CO form as drafted the GC shall digitally sign the form and click SAVE.

B. After the GC digitally signs/saves the CO it shall be routed through the Project Management Web Site for additional review and/or approvals. The CPM shall do the following:
   1. Monitor the review process to ensure the software is working properly at each review step.
   2. Ensure that proper BPW procedures are executed as needed by the CO approval process.
      a. Schedule the CO on the next available BPW agenda if required.
         i. Attend the BPW meeting to speak on the CO to board members and answer questions.
         ii. The GC and/or PA may be required to attend the BPW meeting to address specific information as it relates to the Work and/or materials associated with the CO.
   3. Monitor final approval and distribution of the CO.
   4. Notify the GC that the CO has been completed.
   5. Ensure that the CO is posted to the next Public Works payment schedule.
   6. Verify that the GC's next Progress Payment-Schedule of Values show the CO as part of the contract sum.

C. Upon final approval of the CO the GC may proceed with executing the Work associated with the CO.

END OF SECTION

SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 – GENERAL

1.1. SUMMARY

A. The Schedule of Values (SOV) is a Contractor provided statement that allocates portions of the total contract sum to various portions of the contracted work and shall be the basis for reviewing the Contractors Progress Payment Requests.

B. AIA Document G702 – Application and Certificate for Payment and AIA Document G703 Continuation Sheet shall be filled out in sufficient detail to be used as a guideline in determining work completed and materials stored on site when verifying Progress Payment Requests.

C. The General Contractor shall be responsible for filling out, updating, and providing these work sheets with each Progress Payment Request.

1.2. RELATED SPECIFICATIONS

A. Section 01 26 63 Change Order (CO)
B. Section 01 29 76 Progress Payment Procedures
C. Section 01 31 23 Project Management Web Site
D. Section 01 32 26 Construction Progress Reporting
E. Section 01 33 23 Submittals

F. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public Works Construction".

1. Use the following link to access the Standard 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 Standard Specification **2**10.2" 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. RELATED DOCUMENTS

A. The following documents shall be used as the basis for initiating and maintaining the SOV worksheets throughout the execution of this contract.

1. Drawing documents and specifications (including general provisions) as provided with the bid set documents and any published addendums.
2. Documents associated with revisions or clarifications to number 1 above after awarding of the contract, including but not limited to:
   a. Construction Bulletins
   b. Request for Information
   c. Approved Change Orders
3. The latest daily/weekly Construction Progress Report
4. Other specifications as identified in Section 1.2 above

1.4. BASIS OF VALUES

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

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. AIA DOCUMENT G702 – APPLICATION AND CERTIFICATE FOR PAYMENT

A. The Contractor shall use AIA Document G-702 Application and Certificate for Payment with each Progress Payment Request.

B. Completely fill out the Project Information section as follows:
   1. TO OWNER; provide all owner related information as provided in the contract documents.
   2. PROJECT; provide all contract information including contract number, title and address.
   3. FROM CONTRACTOR; provide all contractor related information.
   4. VIA ARCHITECT; provide all the architect's related information including the architect's project reference number if different from the owners.
   5. Indicate the current APPLICATION NO., PERIOD TO date, and CONTRACT DATE.

C. Completely fill out the Contractors Application for Payment section.
   1. Fill out lines 1 through 9 to reflect the current status of the contract through the payment date being requested.
   2. The City of Madison calculates retainage on Public Works Contracts as follows:
      a. In general, across the duration of the contract, 2.5% of the total contract sum, including change orders, is withheld for retainage as referenced from the City of Madison Standard Specification 110.2:
         i. Beginning with Progress Payment 1, 5% retainage will be withheld until such time that 50% of the total contract sum has been paid out.
         ii. No additional retainage will be withheld after 50% of the total contract sum has been paid, unless additional change orders have been approved after the 50% milestone has been reached. Per City of Madison Standard Specification 110.2, additional retainage up to 10%, may be held in the event there are holds placed by Affirmative Action or liquidated damages by BPW.
         iii. Retainage for additional change orders after the 50% milestone will be withheld at the rate of 2.5% of the total cost of the change order.
         iv. Retainage is based on the change orders posted to the City's contract worksheet at the time the progress payment is processed.

D. Completely fill out the Change Order Summary section. Only change orders that have been finalized and posted to the City of Madison's Application for Partial Payment worksheet may be itemized into the SOV documents.

E. The Contractor shall sign and date the application and it shall be properly notarized.

F. The Contractor shall not fill in any information in the Architects Certificate for Payment section.

3.2. AIA DOCUMENT G703 – CONTINUATION SHEET

A. The Contractor shall use AIA Document G-703 Continuation Sheet to itemize his/her SOV for this contract. Provide additional sheets as necessary.

B. Provide information in Column A (Item No.), Column B (Description of Work), and Column C (Scheduled Value) by any method that allocates portions of the total contract sum to various portions of the contracted work. Possible methods include combinations of the following:
   1. By division of work
   2. By contractor, sub-contractor, sub sub-contractor
   3. By specialty item or group
   4. Other methods of breakdown as may be requested by the City Project Manager or City Construction Manager at the pre-construction meeting.

C. Provide total cost of the item/description of work including proportionate shares of profit and overhead related to the item.

3.3. INITIAL SCHEDULE OF VALUES SUBMITTAL

A. The Contractor shall upload his/her initial SOV to the Project Management Web Site, Submittals Library, no later than five (5) working days after the Pre-construction Meeting.
   1. The initial SOV shall provide information in Column A (Item No.), Column B (Description of Work), and Column C (Scheduled Value) only.
   2. The level of detail shall be as described in section 3.2 above.

B. The Project Architect (PA) and the City Project Manager (CPM) shall review the SOV as any other submittal and may require modifications to reflect additional detail as necessary.

C. The Contractor shall resubmit the SOV as necessary until such time as the PPA and CPM have sufficient detail for assessing and approving future Progress Payment Applications.

D. Progress Payment Application 1 will not be processed until such time as the Contractor has met this requirement regardless of the amount of work completed per the application.

3.4. SOV FOR PROGRESS PAYMENT REQUESTS

A. The Contractor shall update the initial SOV with each Progress Payment Application as follows:
   1. Initial items and values as part of Section 3.3 above will not be adjusted once the original Schedule of Values submittal has been approved.
   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 D, E, F and G 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 updated G702 and G703 sheets 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

PART 1 – GENERAL

1.1. SUMMARY

A. The General Contractor (GC) shall review this and all related specifications prior to submitting progress payment requests.

B. Progress payment requests (Partial Payment-PP) for this contract shall be uploaded digitally by the GC to the Project Management Web Site

C. The Project Architect (PA) and City Project Manager (CPM) shall review and amend or approve the PP on the Project Management Web Site.

D. After approval of the PP by the CPM, he/she shall forward the PP to the appropriate agencies for BPW contractual review and payment processing.

1.2. RELATED SPECIFICATIONS

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

1.3. RELATED DOCUMENTS

A. The following documents shall be used when evaluating PP requests.

1. Daily and weekly construction progress reports filed since the last payment request.
2. Contractors Schedule of Values as updated from the last payment request. See Specification 01 29 73.
3. Any document that may be required to be submitted for review and approval, as noted by the specifications listed in Section 1.2 above, or the Progress Payment Milestone Schedule in Section 1.4 below, to achieve a required bench mark of contract progression or contract requirement.

1.4. PROGRESS PAYMENT MILESTONES

A. City Engineering-Facility Management has developed the Project Payment Milestone Schedule (Section 1.4 below) to assist the GC in providing required construction specific documentation and general contractual documentation in a timely manner.

B. The Progress Payment Milestone Schedule is not an all inclusive list. Multiple agencies review progress payment requests and contract closeout requests. Missing, incomplete, or incorrect documentation for any agency may

be a cause for not processing progress payments. It shall be the sole responsibility of the Contractor for providing documentation as required or requested to the appropriate agencies.

C. The milestone schedule is based on the contract total sum and shall be valid for most contracts. Milestone submittals will be required with whatever progress payment hits the percentage of contract total indicated in the schedule.

D. The CPM shall review the milestone schedule with each progress payment request and at his/her option may elect to hold processing the progress payment until such time as the contractor has met the requirements for providing construction specific documentation.

E. It shall be the General Contractors responsibility to comply with all BPW Contract Administration requirements and related deadlines as outlined in the Award Letter, Award Checklist, and Start Work Letter.

Progress Payment (PP) Milestone Schedule		
Milestone Description	***Due Before***	***Remarks***
BPW Contract Administration Documentation • Workforce profiles • Best Value Contracting Documentation • Sub-contractors prequalification approval & Affirmative Action plans • Other as may be required	PP-1, or start work as applicable	• 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
Required Construction Submittals/Administrative Documents • Contractors Project Directory • Schedule of Values • Submittals Schedule • Waste Management Plan • Closeout Requirement Checklist • Warranty Checklist • Restoration specialist(s) qualifications.	PP-1	References • Specification 01 31 23 • Specification 01 29 73 • Specification 01 32 19 • Specification 01 74 19 • Specification 01 77 00 • Specification 01 78 36 • Various specifications.
Construction Progress Milestones • Early submittals, per submittal schedule • Detailed Contract Schedules	PP-1	See specifications for specific requirements • 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 • 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 • 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**		
BPW Contract Administration Documentation • Weekly payroll reports • Best Value Contracting Reports	25% CT or PP 2	See 1.4.E above. *This progress payment will be with held by BPW for any missing contractual documentation.*

Progress Payment (PP) Milestone Schedule		
Milestone Description	***Due Before***	***Remarks***
• SBE Reports		
Construction Progress Milestones • Construction/Contract Closeout Meeting #1 • Submittals/Re-submittals complete	50% CT	• Specification 01 31 19 • Specification 01 33 23
Operation and Maintenance (O & M) drafts	60% CT	• Specification 01 78 23
Construction/Contract Closeout Meeting #2 • Construction closeout checklist	70% CT	• Specification 01 31 19 • Specification 01 77 00
BPW Contract Administration Documentation • Request Finalization Review from BPW	80% CT	This is a recommendation to the GC and is not a requirement of this PP. • Specification 01 77 00
Construction Progress Milestones • Operation and Maintenance (O & M) finals, accepted • All major QMO issues resolved • As-Built Drawings, Division Trades ready for GC review	80% CT	• 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: • 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: • Governing ordinances and statutes • Specification 01 45 16 • Specification 01 79 00 • Specification 01 78 43 • Specification 01 74 13
Construction Closeout Procedures: • 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	• 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 • Construction Closeout has been completed • Contractor requests final payment of retainage upon receiving City Letter of Substantial Completion • All BPW contractual requirements are verified	Final	• Specification 01 77 00 • Contractor must provide any missing BPW Contractual Documentation
*** Completion of this closes the contract but not the warranty period/bond.**		

Progress Payment (PP) Milestone Schedule		
Milestone Description	***Due Before***	***Remarks***
***NOTE:* CT = Contract Total less held retainage**		

1.5. PROGRESS PAYMENT SUBMITTAL

A. Each progress payment submittal shall be:
   1. Digital in PDF format
   2. PDF shall be in color
   3. Uploaded to the appropriate Project Management library and properly named per the tutorial instructions provided to the awarded contractor.

B. Submit all required construction progress documentation to the appropriate Project Management Web Site library.

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 provide an updated version of his/her schedule of values (AIA documents G702 & G 703) with each PP request.
   1. The AIA - Application and Certificate for Payment (G702) shall be properly filled out and prepared for the Architects review. See specification 01 29 73, Schedule of Values for more information.
   2. The AIA - Continuation sheets (G703) shall be properly filled out and indicate the dollar value of the completed work to date for each item on the form. See specification 01 29 73, Schedule of Values for more information.
      a. The GC shall subtotal the work completed to date for all of the original Schedule of Value items.
      b. Divide the sub total of work completed by the Original Contract Total to obtain a percentage complete of the original Lump Sum Bid. This percentage may be taken out to five (5) decimal places (round fifth place up or down as needed).
         i. Example: $5,192.55 of completed work divided by $10,000 original Contract Total = 0.519255, round this to 0.51926
      c. Write the percentage in Column 10 on the City Tabular Sheet for the original lump sum bid item in RED ink.
   3. Ensure that any newly posted change orders from the City of Madison provided tabulation sheet have been entered on the G703 continuation sheets. Repeat steps a thru c above for each change order on the schedule of values and the City Tabular Sheet.

B. The GC shall fill out the City of Madison Application and Certificate of Payment cover sheet as follows:
   1. The GC shall not change any pre-printed information and shall not write in the box that indicates previous progress payments.
   2. The GC shall sign and date the form where indicated.
   3. The GC shall provide the dates from and to for the PP being requested.

4. The GC shall provide the list of all contractors/sub-contractors that were actively working during the dates indicated above.
    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.

C. The General Contractor (GC) shall scan all of the documents listed below in the order shown, save the scan as a single PDF file for each PP request.
1. City cover sheet – Application and Certificate for Payment
2. City tabulation sheet(s)
3. AIA G702 - Application and Certificate for Payment
4. AIA G703 - Continuation Sheet(s)
5. Any miscellaneous documents that may be requested as backup documentation for the pay request.
    a. Lien waivers are not required and shall not be submitted.
    b. Do not provide contractual administrative documents such as pay reports with pay requests.
    c. Do not supply progress deliverables with pay requests.

F. Upload the pay request PDF to the Contract Documents-GC Partial Pay Apps library on the Project Management Web Site.

3.2. PROJECT ARCHITECT PROCEDURE

A. The PA shall review the AIA-continuation sheets provided by the GC to determine if the Schedule of Values accurately reflects the work completed for the inclusive dates indicated.
B. The PA shall advise the CPM of any discrepancies in the schedule of values.
C. The PA shall work with the GC and the CPM to resolve any issues prior to signing the AIA - Application and Certificate for Payment.
D. When verified, the PA shall digitally sign the original PDF version of the AIA - Application and Certificate for Payment on the Project Management Web Site.

3.3. CITY PROJECT MANAGER PROCEDURE

A. The CPM shall review all documents submitted by the GC and work with the PA 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.
C. When verified, the CPM shall digitally sign the City Cover Sheet and forward the required documentation to the appropriate City agencies for further processing of the payment request.
D. The CPM shall add a scanned copy of any documents indicating the PP request processing was completed to the PMWS.

END OF SECTION

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SECTION 01 31 13
PROJECT COORDINATION

PART 1 – GENERAL

1.1. SUMMARY

A. Project Coordination covers many areas within the execution of the Contract Documents and the requirements of proper coordination are the applicable to all contractors executing the Work of this contract.

B. This specification provides general information regarding project coordination for the General Contractor and all Sub-contractors. All contractors shall be familiar with project coordination requirements and responsibilities that may be defined in other specification within these Contract Documents.

C. The General Contractor shall at all times be responsible for the project, project site, and execution of the Contract Documents.

1.2. RELATED SPECIFICATIONS

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

1.3. GENERAL REQUIREMENTS

A. The following general requirements shall applicable to all contractors:
   1. Cooperate with the Owner, all authorized Owner Representatives, Project Architect and all consultants of the Owner.
   2. Materials, products, and equipment shall be new, as specified and to industry standards except where otherwise noted.
   3. Labor and workmanship shall be of a high quality and to industry standards.

B. Existing conditions:
   1. Verify all existing conditions noted in the contract documents with actual filed locations. Verify dimensions, sizes and locations, of structural, equipment, mechanical and utility components.
   2. Report any inconsistencies, errors, omissions, or code violations in writing to the General Contractor (GC) immediately.
   3. Annotate any inconsistencies, errors, omissions on the GC As-Built record drawings immediately for future reference.

C. Contract Documents:
   1. The Contract Documents are intended to include everything necessary to perform the work. Every item required may not be specifically mentioned, shown, or detailed.
      a. Except where specifically stated all systems and equipment shall be complete, installed, and fully operable.
      b. If a conflict exists within the contract documents the contractor shall furnish the item, system, or workmanship of the highest quality, largest, largest quantity, or most closely fits the intent of the contract documents.

c. Manufacturers recommended installation details shall be verified and used prior to installation of products and equipment so as to not void warranties.

D. Errors and Omissions
1. No Contractor shall take any advantage of any apparent error or omission in the construction documents.
2. The City of Madison shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the construction documents.

E. Owners Representatives
1. All contractors shall be familiar with various Owner Representatives having Quality Management responsibilities for the duration of this project including but not limited to the following:
a. Project Architect, responsible for all decisions affecting the code compliance and design intent of the construction documents.
b. Consulting Architects and Engineers, responsible for providing consulting services to the Project Architect, Owner, and City Project Manager, also responsible for Quality Management of the construction documents.
c. Owner, the designated representative of the City Agency that will occupy the project upon completion.
d. City Project Manager, responsible for all day to day decisions regarding the execution and performance of this Public Works Contract.
e. Consulting City Staff, responsible for providing consulting services to the Project Architect, Owner, and City Project Manager, also responsible for Quality Management of the construction documents.
f. Commissioning Agent (CxA), responsible for ensuring that the project is meeting the Owner's Project Requirements and related quality assurance procedures.
2. Owner Representatives shall be attending progress meetings, pre-installation meetings, performing or being present for final testing and acceptance and quality management reporting during the execution of the contract documents as outlined in other specifications.

1.4. GENERAL CONTRACTOR PERFORMANCE REQUIREMENTS

A. Assume the responsibility for all Work specified in the Contract Documents except where specifically identified to be performed by the Owner or other contractor separately hired by the Owner.
1. Coordinate all work by Owner, equipment provided Owner, or contractor hired by the Owner into the project schedule.

B. Provide all construction management responsibilities as specified in other Division 1 specifications including but not limited to:
1. Scheduling of work
2. Coordination of work between other Trades and Sub-contractors
3. Construction administration and management
4. Site layout, cleanliness, and protection of completed work/stored materials
5. Waste Management
6. Quality Assurance and Quality Control

C. Use Diggers Hotline and private utility locating companies to accurately locate all public and private utilities on the property as needed. The GC is responsible for any repair or replacement to any public or private utility damaged during the execution of the Work

D. Report any inconsistencies, errors, omissions, or code violations in writing to the Project Architect immediately. Failure to report inconsistencies prior to beginning work shall indicate that the GC accepted all existing conditions.

E. The GC shall be responsible for assigning work and related responsibilities where the Contract Documents may not clearly state who is responsible for providing the work, material, or product.

F. Provide construction management oversight of all items described in Section 1.5 below.

G. Coordinate and assist CxA as outlined within 01 91 00 and as directed by Owner.

1.5. SUB-CONTRACTOR PERFORMANCE REQUIREMENTS

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

B. Coordinate your Work with all adjacent work and existing conditions.

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

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to identify various project related meetings and the responsible parties for scheduling, agendas, minutes, and required attendance.

B. This specification is not intended to be inclusive of all meeting types or a complete list of required meetings.

C. This specification is not intended to cover planning and execution meetings between the General Contractor (GC) and his/her sub-contractors.

1.2. RELATED SPECIFICATIONS

A. 01 31 23 Project Management Web Site

B. 01 32 16 Construction Progress Schedules

C. 01 43 39 Mockups

D. 01 91 00 Commissioning

1.3. PROJECT MEETING TYPES

A. The following project meeting types may be used but not limited to the following

1. Preconstruction Meeting
2. Project Management Web Site – Tutorial Meeting
3. Construction Progress Meetings
4. Pre-installation Meetings (including mock-up review meetings)
5. Weekly Trade Meetings
6. Special Meetings
7. Commissioning Meetings

1.4. GENERAL REQUIREMENTS

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

PART 2 – PRODUCTS – NOT USED IN THIS SECTION

PART 3 - EXECUTION

3.1. PRECONSTRUCTION MEETING

A. After execution of the Contract the City Project Manager (CPM) shall schedule and conduct the Preconstruction Meeting at the Owner's facilities. The CPM shall coordinate the meeting agenda with the Project Architect and the GC Project Manager.

B. The CPM shall be responsible for the final agenda.

C. The CPM and Project Architect shall take notes on the meeting and post completed meeting minutes.

D. Attendance shall be required by all of the following:

1. Owner Representative(s)

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 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.
D. It is recommended that all contractors bring their lap top, tablet or other internet capable device with them including a fully charged battery and internet connection devices as necessary.

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.

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 he is 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

PART 1 – GENERAL

1.1. GENERAL DESCRIPTION

A. The City of Madison (CoM) has established a web based Project Management Tool (PMT) using a Microsoft product called SharePoint (SP).

B. The software is used throughout the design, construction and warranty process of major remodels and new construction projects executed as a City of Madison, Board of Public Works project.

C. Initially deployed in mid-2013, the PMT software has been successfully deployed on several projects, and we continue to modify/update/enhance the PMT on a regular basis.

1.2. SHAREPOINT PROCEDURE OVERVIEW

A. The CoM PMT is a system of consolidated Document & Form Libraries and Data Lists that assist in performing day to day functions of design/construction management while reducing the use of surface mail, email and email attachments.

1. Document libraries store a wide variety of documents in many different formats including but not limited to Word, Excel, PDF, photographs (all popular formats), etc.
2. Data Lists contain consolidated data information that can be generated and stored for further use. Punch Lists and Warranty issues will be examples of Data Lists.
3. Form Libraries are primarily used when a specific work flow process is needed. The form acts as the cover letter. An example of this would be the Submittal Review Process.
4. Libraries are controlled by Permission Groups and Permission Levels.

B. The following libraries and sub-libraries on the PMWS are provided for specific workflows and contract documentation. Related specification numbers are in "( )" if applicable.

Contract Documents	Construction Administration	Construction Progress	LEED Documentation	Quality Control	Construction Closeout
GC Partial Pay Apps (01 29 76)	*Change Order Requests (COR Form) (01 26 57)*	*Schedules (01 32 16)*	*LEED Documents*	*Regulatory Inspections*	*Misc Closeout Documents*
Construction Documents	*Change Orders (CO Form) (01 26 63)*	*Progress Meetings (01 31 19)*	*Waste Management (01 74 19)*	*Commissioning Checklists*	*O & M Manuals (01 78 23)*
Regulatory Documents	*Construction Bulletins (CB Form) (01 26 46)*	*Daily Journal (DJ Form) (01 32 26)*		*System Performance Tests*	*Product Warranties /Guarantees (01 78 36)*
Testing Contract	*Request for Information (RFI Form) (01 26 13)*			*Quality Management Observation (QMO Form) (01 45 16)*	*As-Builts (01 78 39)*
	Submittals (SUB Form) (01 33 23)			*Safety and Incident Reports*	*Attic Stock (01 78 23)*
	Substitution Request (SR Form) (01 25 13)			*Material Testing & Field Reports*	*Demonstration and Training (01 79 00)*

Contract Documents	Construction Administration	Construction Progress	LEED Documentation	Quality Control	Construction Closeout
					Warranty Issues (WI Form) (01 78 23)

C. 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.

D. 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.

E. 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 libraries.

F. 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 SP workflows, the GC will determine to what level over the minimum requirements the SC's will be involved.

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

PART 2 - PRODUCTS

2.1. SHAREPOINT SYSTEM RELATED PRODUCTS

A. SharePoint is a Microsoft Windows based software that requires no additional software installation, hardware or other special requirements/applications for the users. There are no costs associated with the use of this system.

B. Currently the CoM is using SharePoint 2010.

1. SharePoint works best if the user's computer is running Windows versions 7 through 8.1.
2. SharePoint works best when used with Internet Explorer versions 9 - 11 (32 bit).

a. At this time SharePoint is not compatible with other internet browsers such as Fire Fox, Google Chrome, and Safari.

PART 3 - EXECUTION

3.1. POST BID-OPENING

A. After bids have been opened, a successful bidder has been determined, and bid acceptance procedures have been initiated the City Project Manager (CPM) will contact the GC to provide the following information.

1. Project Management Software Tutorial. This tutorial is in a PDF printable format with screen shots and associated instructions on how to access and use the PMT.

a. Tutorial instructions will include but not be limited to the following:

i. Descriptions of various libraries, documents, and forms that will be used throughout the construction project.

ii. Uploading procedures for various types of documents including standardized naming conventions.

2. A blank Project Directory in an Excel spread sheet format. The contractor shall provide the following information for GC and SC staffs as indicated on the spreadsheet. This will generally be the Project Manager for the GC as well as the Sub-contractors and the GC Site Supervisor.
    a. Last Name, First Name
    b. Company Name
    c. Email address (valid, work related)
    d. Work Phone Number (required, include area code)
    e. Cell Phone Number (not required, include area code)
3. The GC shall provide the above information for all SC's where the GC is not self-performing the work.
4. The GC may provide project foreperson information for work being self-performed if he/she so desires.

3.2. POST PRE-CONSTRUCTION MEETING

A. The GCPM will return the completed Project Directory spread sheet to the CPM no later than the Pre-construction meeting.

B. The CPM is responsible for uploading all project directory data into SharePoint and coordinating with CoM Information Technology (CoM-IT) for creating the logins and passwords of non-city staff (GC/SC staffs).

C. All GC/SC staff will be notified through an automated email from CoM IT that logins and passwords are available. It is the responsibility of each GC/SC to call the CoM-IT number provided in the email to receive his/her login/password over the phone. Logins and passwords will not be released via email.

D. Once the GCPM has received his/her login/password uploading of contract related documents can begin. This would include but not be limited to project schedules, submittals, RFI's, and other documents as needed.

E. All workflows, review of documentation, and general archiving of construction related documentation will be conducted on the PMWS. These documents will generally not be emailed.

F. The following documents related to the execution of the contract will not be part of the PMWS:
1. All documentation related to executing the contract, such as:
    a. Sub Contractors list
    b. Affirmative Action documentation
    c. Bonding documentation
    d. Documentation associated with payroll verification
    e. Final documentation associated with closing out the contract
2. Any documentation required/generated by ordinance, code or statute, such as;
    a. Erosion Control inspections
    b. Building Inspection Department inspections

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULES

PART 1 – GENERAL

1.1. SCOPE

A. This specification is to identify various project related schedules associated with indicating construction progress and outlook. The following schedules are the responsibility of the General Contractor (GC).
   1. Overall Project Schedule
   2. 6 Week Look-out Schedule

B. This specification is not intended to include internal schedules generated by the contractors during their planning and execution of the contract.

1.2. RELATED SPECIFICATIONS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL PROJECT SCHEDULE (OPS)

A. The GC shall prepare an OPS that covers the duration of the contract from the pre-construction meeting through the end of construction to final contract closeout.
   1. The GC shall review Specification 01 77 00 Closeout Procedures to become familiar with definitions, differences, and requirements for closing out the construction and contract including the association with progress payments.

B. The GC shall provide copies and lead a discussion on the OPS during the pre-construction meeting.
C. The OPS shall indicate start and end dates of each task associated with the project.
D. The OPS shall clearly indicate the critical path of the project.
E. The GC shall update the OPS as often as necessary during the duration of the project. Updates will be briefed as needed during bi-weekly progress meetings.

3.2. 6 WEEK LOOK-OUT SCHEDULES (LOS)

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

C. The LOS shall indicate start and end dates of each major task, associated related sub-tasks, and required parallel or pre-requisite tasks required to complete the major task on time.

D. The LOS shall also include identifying and scheduling such events as:
   1. Pre-installation meetings and mock-up review meetings.
   2. Quality management reviews of installations before they are covered.
   3. Owner provided equipment as designated by the contract documents.
   4. Work by others as designated by the contract documents.
   5. Critical submittal dates.

E. The GC shall update the LOS prior to each bi-weekly progress meeting to indicate the next 6 weeks of scheduled work. Updates will be briefed during each bi-weekly progress meeting.

3.3. PROJECT MANAGEMENT WEB SITE (PMWS)

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

END OF SECTION

SECTION 01 32 19
SUBMITTALS SCHEDULE

PART 1 – GENERAL

1.1. SUMMARY

A. The General Contractor shall submit a complete and comprehensive list of all submittals anticipated during the execution of this contract.

B. The GC shall include the Administrative submittals identified in item 1.5 below and shall be required to up load them to the Project Management Web Site.

C. The initial Submittals Schedule shall be based on the original contract documents used at the time of bidding and any posted addenda through awarding of the contract.

D. The Submittal Schedule may be appended during the execution of the contract based on amendments to the contract in the form of Change Orders, Construction Bulletins, and other related documents that add, or change the scope of the work.

1.2. RELATED SPECIFICATIONS

A. Section 01 29 76 Progress Payment Procedures
B. Section 01 31 23 Project Management Web Site
C. Section 01 33 23 Submittals
D. Section 01 91 00 Commissioning

1.3. RELATED DOCUMENTS

A. The following documents shall be used as the basis for initiating the original Submittals Schedule.
   1. Drawing documents and specifications (including general provisions) as provided with the bid set documents and any published addenda.

B. The following documents shall be used to amend the submittals schedule as needed during the execution of this contract.
   1. Documents associated with revisions or clarifications to number A.1 above after awarding of the contract, including but not limited to:
      a. Construction Bulletins
      b. Approved Change Orders

1.4. SUBMITTAL DEFINITIONS

A. Administrative Submittal: Any submittal that may be required by a Division 1 Specification and as noted in Section 1.5 below.

B. Critical Path Submittal: Any early submittal that needs a priority review due to early construction use or long lead times where a delay could affect the critical path of the construction schedule

C. Submittal: Any material, product, equipment, or general requirement as outlined in this and other specifications that require a favorable review or acceptance prior to proceeding with procuring the item or proceeding with the Work.

1.5. SUBMITTAL REQUIREMENTS

A. The GC and all Sub-contractors shall review the construction documents including the specifications of their individual Division or Trade to compile a complete list of all materials, products, or equipment that will require a positively reviewed submittal to be completed prior to procurement and installation.
   1. Submittals shall include but not be limited to any of the following that may apply:
      a. Shop Drawings
      b. Product Data
      c. Assembly Drawings
      d. Engineered Drawings
      e. Product Samples

B. The following items will require an approved submittal, verify with specifications for specific needs and requirements:
   1. Contractor certifications for specialized work such as asbestos removal, well drilling, controls, AV, etc.

1.6. ADMINISTRATIVE SUBMITTALS

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. OVERALL RESPONSIBILITIES OF ALL CONTRACTORS

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 submittals to the General Contractor.

B. Each list shall indicate the title of the submittal, the associated specification of the submittal, whether the submittal can be considered an early/middle/late submittal, the anticipated date the submittal will be provided and the anticipated date the submittal needs to be approved.

C. Contractors shall be aware that the goals for submittal review by the Architect staff and City staff will be as follows:
   1. For items on the Critical Path as identified by the GC, five (5) working days
   2. For most other submittals ten (10) working days
   3. Additional time may be needed for complex submittals or if re-submittals are required.

D. The general format of the Submittal Schedule shall be tabular as per this example:

Title	Specification	Critical Path (Y or N)	Date provided	Date required	Remarks
Concrete Mix Design	03 30 00	Y	Oct 1, 2014	Oct 15, 2014	
Paint Draw Downs	09 90 00	N	Jan 2, 2015	Jan 20, 2015	

3.2. GENERAL CONTRACTORS RESPONSIBILITIES

A. The General Contractor shall be responsible for all of the following:
   1. Consolidating all submittal lists from individual contractors into one master list.
   2. Reviewing all submitted lists for completeness, timing with the overall contract, etc. The GC shall meet with individual contractors to make changes as necessary.
   3. Upload the completed Submittals Schedule to the Submittal Library on the Project Management Web Site for review as SD 003.0. See Specification 01 33 23 Submittals for more information on this procedure.
   4. Resubmit the schedule as needed after initial reviews have been completed.

B. The GC shall work with other contractors to amend the Submittals Schedule throughout the execution of the project based on changes and modifications as needed.

C. The GC and Project Architect shall be responsible for reviewing and briefing the submittal schedule and submittals status at each bi-weekly construction meeting.

3.3. STAFF REVIEW RESPONSIBILITIES

A. The Project Architect, consulting staff, Commissioning Agent (CxA), Owner, and city staff will review the Submittal Schedule for completeness per the plans and specifications within their divisions of work. The reviewing staff may provide comments as needed. Some examples might include the following:

1. Submittal not required
2. Provide photos of samples with digital submittal
3. Insure one submittal for complete system
4. Append the schedule to include…
5. See Specification <xyz> for additional requirements

B. The Project Architect and City Project Manager will finalize review comments regarding the Submittal Schedule. Re-submittal of the submittal schedule may be required.

END OF SECTION

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SECTION 01 32 26
CONSTRUCTION PROGRESS REPORTING

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 his/her choosing provided it is legible and contains the information as outlined in Section3.1 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 on the Contractor Daily/Weekly Report Form located in the Construction Progress-Daily Journal Library on 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.

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

3.2. CONSTRUCTION PROGRESS MEETINGS

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

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

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 (SharePoint).

B. The GC shall be required to provide digital time-lapse photo service of the project exterior construction progress.

1.2. RELATED SPECIFICATION SECTIONS

A. Section 01 29 76 Progress Payment Procedures
B. Section 01 31 23 Project Management Web Site (SharePoint)
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).

2.1. 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.
   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

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 SharePoint Project Images Library.
   1. The GC shall upload the photos to the folder that designates the appropriate construction week and date (beginning Monday date). If no folder exists, contact the CPM/CCM prior to uploading photos.

3.2. REQUIREMENTS FOR TIME LAPSE PHOTOGRAPHS

A. The GC shall be responsible for all of the following:
   1. Verify with the CPM/CCM a suitable place for mounting the camera and related equipment prior to installation.
   2. The complete installation, setup, maintenance, and removal of the camera and related equipment.
   3. The hosting and access of all photographs and videos taken by the camera during the project.
   4. 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.

3.3. PROJECT MANAGEMENT WEB SITE (SHAREPOINT)

A. The CPM/CCM shall provide weekly progress folders in the Project Images Library on SharePoint.
   1. Progress folders are labeled with the Construction Week Number and the date for Monday of that week.
   2. The GC shall notify the CPM/CCM if additional weekly progress folders need to be created.

B. The GC shall upload the weekly digital photographs to the appropriate progress folder in the Project Images Library.

C. Copies of Time Lapse video shall be uploaded to a separate project folder in the Project Images Library prior to Construction Closeout.

END OF SECTION

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SECTION 01 33 20
ELECTRONIC MEDIA RELEASE STATEMENT

In accepting and utilizing any drawings, specification, or other data on any form of electronic media (the "Data") generated and provided by LOTHAN VAN HOOK DESTEFANO AND ARCHITECTS LLC (LVDA) and its Consultants, the user covenants and agrees that all such drawings and data are instruments of service of LVDA., and its Consultants, shall retain all common law, statutory law and other rights, including copyrights, and no transfer of rights is intended by this transmittal.

The Data is scaled but are not intended for use in construction. The electronic files submitted by LVDA to the under signed are submitted for use in preparing submittals for the project described above ("Project") only. By accepting and using the Data, you agree to the terms set forth below.

The user further agrees not to use the Data, in whole or in part, for any client, purpose or project other than the Project. LVDA and its Consultants are not liable for claims resulting in any way from unauthorized changes made by user or user's reuse of the Data for any other project. User will indemnify and defend LVDA and its Consultants from any damage, liability or cost, including reasonable attorneys' fees, arising from any actions on user's part that result in changes or reuse of the Data without the prior written consent of LVDA.

The Data is provided without warranties of any kind, including express, implied or statutory warranties of fitness for a particular purpose, merchantability or non-infringement.

LVDA and its Consultants take no responsibility for the Data's compatibility with software or hardware used by the recipient. We recommend that the Data be screened for virus contamination prior to its use. The user warrants that they have to authority to accept these terms on behalf of the use and LVDA can rely upon said authority.

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SECTION 01 33 23
SUBMITTALS

PART 1 – GENERAL

1.1. SUMMARY

A. The General Contractor (GC) shall be responsible for providing submittals for review of all contractors and sub-contractors as designated in the construction documents. Submittals shall include but not be limited to all of the following:
   1. Equipment specified and pre-approved in the specification; to ensure quality, construction, and performance specifications have not changed since final design.
   2. Equipment specified by performance in the specification; to ensure that the intended quality, construction, and performance specified is met by the selected material or product.
   3. Shop, piece, erection, and other such drawings as indicated in the specifications to ensure all structural, dimensional, and assembly requirements are being met.
   4. Submittals indicating installation sequencing
   5. Submittals indicating control sequencing
   6. Contractor licensing, certification, and other such regulatory documentation when required by a specification.
   7. Other submittals as may be required by individual specifications.

B. The submittal process shall not be used to determine alternates to specified products or equipment. All considerations shall be reviewed during the bidding process and acceptable alternates shall be acknowledged by addendum prior to the closing of bidding. See bidding instructions for the information on submitting alternates for consideration.

D. In the event that a manufacturer has significantly changed a product (discontinued a model, changed dimension or performance data changed available colors, etc.) since bid opening the GC shall submit a Request for Information (RFI) to the Project Architect requesting other approved alternates prior to uploading a digital submittal.

E. Contractors and sub-contractors shall be responsible for knowing the submittal requirements of ALL sections within their scope of work under the contract. The Owner reserves the right to request documentation on any materials, equipment, or product being installed where a submittal is not on file. If the material, equipment, or product installed is determined not to meet the intent of the specification the contractor/sub-contractor shall be required to remove and replace the items involved. The GC shall be solely responsible for all costs associated with the removal and replacement.

1.2. RELATED REFERENCES

A. Section 01 29 76 Progress Payment Procedures
B. Section 01 31 23 Project Management Web Site
C. Section 01 32 19 Submittals Schedule
D. Section 01 32 26 Construction Progress Reporting
E. Section 01 91 00 Commissioning
F. All Technical Specifications, contract documents, construction drawings, and any published addendums during the bidding process.
G. All contract documents generated during the execution of the contract including but not limited to Requests for Information (RFI) and Construction Bulletins (CB).

1.3. SUBMITTAL REQUIREMENTS

A. A completed submittal shall meet the following requirements:

1. Digital submittal shall be original PDF of manufacturer's data sheets or high quality color scan of the same.
    a. Submittals shall not include sales fliers or other similar documents that typically do not provide complete manufacturers data.
2. Documents within the PDF submittal shall be printable to a sized sheet no less than 8-1/2 by 11 inches and no larger than 24 by 36 inches.
3. At the beginning of each submittal the contractor shall identify the plan reference (WC-1, EF-3, etc.) in RED block letters that the submittal is for.
4. Where multiple model numbers appear in a table the contractor shall identify the specific model being submitted by using a RED square, box, or other designation to distinguish the correct model from others on the page.

B. A complete submittal will include all information associated with the product or equipment as presented in plans, equipment tables, and specifications. Information shall include but not be limited to the following:
1. Dimensional data
2. Performance data
3. Resource requirements, power, water, waste, etc
4. Clearance and maintenance requirements
5. Finish information, colors, textures, etc.
6. Warranty information

C. Where a submittal includes material samples (carpet, tile, paint draw downs, etc.) the contractor shall do the following:
1. The Contractor shall submit the sample(s) as indicated in the specification.
2. The Contractor shall include a quality photograph(s) of the product with the digital submittal. Photographs shall meet the following requirements:
    a. Formatted to be between 500Kb and 1.0 Mb in file size
    b. Have no glare or flash reflection on the sample
    c. Sample fills the frame of the photo and shows detail as needed. Include multiple photos from other angles as needed.
    d. Scanned copies of products or photos are not acceptable.

D. Uploaded submittals should be relative and related to a specific written specification.
1. Do not upload submittals under a broad category or division (I.E. HVAC 23 00 00). Always upload by the specific specification that identifies a required product or performance to be met.
2. Group related items together if the specification is written that way. (I.E. all of the plumbing fixtures and trim relative to one specific specification should be submitted together).
3. Submittals shall be grouped and adhere to the divisions in the submittal schedule. Submittals that do not conform to the submittal schedule and/or specification divisions will be rejected for re-submittal.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTORS PROCEDURES

A. All required submittals will be uploaded to the Construction Administration-Submittal Drawings Library on the Project Management Web Site (PMWS) by the GC.
1. The GC shall open a new Submittal Form in the Submittals Drawings Library for each required submittal from the Submittals schedule.
2. Fill in required information on the form that will be used for routing the review and comments.
3. Attach all documentation as described in Section 1.3 above.
    a. Submit samples under separate cover to the Project Architect when necessary.

B. Uploading the submittal indicates that the GC has reviewed and approved the submittal against the contract document requirements.

C. The GC shall discuss submittal status at all progress meetings and shall monitor submittal review/approval/re-submittal so as to not incur delays in the project schedule.

D. A completed upload of the submittal to the PMWS initiates the review process workflow.

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

3.2. SUBMITTAL REVIEW

A. Upon completion of the submittal upload by the GC the PMWS automatically notifies the appropriate Architect/Engineer and Owner Representative, including CxA, by Division/Specification number that there is a submittal for review.

B. The submittal shall be reviewed internally by the required Architect/Engineer and Owner Representative and CxA in a timely fashion and provide commentary on missing items, incorrect information, or incomplete shop drawings, etc as needed.

C. When the internal review is completed the PMWS will notify the Project Architect the submittal is ready for final review.

3.3. PROJECT ARCHITECTS REVIEW

A. Upon completion of the internal review the Project Architect shall review all internal review comments, confer with the CPM and CxA as needed and determine the appropriate disposition status for the submittal (approved or resubmit).

C. The Project Architect shall summarize final internal review comments onto the submittal cover sheet, provide a final disposition of the submittal and update the review status of the submittal to “Complete…” (with or w/o comments) or “Rejected”.

D. A completed Final Review status initiates the PMWS to notify the GC and appropriate sub-contractor(s) that the review of the submittal has been completed.

END OF SECTION

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SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

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

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

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

D. Mockups: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.

3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.

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

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.

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

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

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional licensed in the State of Wisconsin are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1.4 CONFLICTING REQUIREMENTS

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

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

1.5 ACTION SUBMITTALS

A. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional currently licensed in the State of Wisconsin, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.

2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

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

C. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Statement on condition of substrates and their acceptability for installation of product.
2. Statement that products at Project site comply with requirements.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Statement that equipment complies with requirements.
2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
3. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

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

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
    1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
    1. Contractor responsibilities include the following:
        a. Provide test specimens representative of proposed products and construction.
        b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
        c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
        d. When testing is complete, remove test specimens and test assemblies, mockups (unless indicated to be part of the final work), and laboratory mockups; do not reuse products on Project.
    2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
    1. Build mockups of size indicated.
    2. Build mockups in location indicated or, if not indicated, as directed by Architect or Owner.
    3. Notify Architect and Owner seven days in advance of dates and times when mockups will be constructed.
    4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
    5. Demonstrate the proposed range of aesthetic effects and workmanship.
    6. Obtain Architect's and Owner's approval of mockups before starting corresponding work, fabrication, or construction.
        a. Allow seven days for initial review and each re-review of each mockup.
    7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    8. Demolish and remove mockups when directed unless otherwise indicated.
L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
   2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
   1. Engage a qualified testing agency to perform quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspection will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

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

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

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

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   6. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect, Commissioning Authority, Owner, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Owner with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and re-inspecting corrected work.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Owner's reference during normal working hours.
   1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

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

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

END OF SECTION

SECTION 01 42 00
REFERENCES

PART 1 – GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 CITY OF MADISON STANDARD SPECIFICATIONS FOR PUBLIC WORKS

A. All work performed in the Right-of-Way shall be performed in accordance with the current version of the City of Madison Standard Specifications for Public Works Construction which can be found at http://www.cityofmadison.com/business/pw/specs.cfm. Note that measurement and payment sections of these standard specifications are not applicable to this project.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
    1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. AABC - Associated Air Balance Council; www.aabc.com/.
2. AAMA - American Architectural Manufacturers Association; https://aamanet.org/.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org/.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org/.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org/.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org/default.aspx.
7. ABMA - American Boiler Manufacturers Association; www.abma.com/.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org/.
9. ACPA - American Concrete Pipe Association; www.concretepipe.org/.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); https://aeic.org/.
11. AF&PA - American Forest & Paper Association; www.afandpa.org/.
12. AGA - American Gas Association; www.aga.org/.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org/.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org/Home.
15. AI - Asphalt Institute; www.asphaltinstitute.org/.
16. AIA - American Institute of Architects (The); www.aia.org/.
17. AISC - American Institute of Steel Construction; www.aisc.org/.
18. AISI - American Iron and Steel Institute; www.steel.org/.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org/.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org/.
21. ANSI - American National Standards Institute; www.ansi.org/.
22. AOSA - Association of Official Seed Analysts, Inc.; www.analyzeseeds.com/.
23. APA - APA - The Engineered Wood Association; www.apawood.org/.
24. APA - Architectural Precast Association; www.archprecast.org/.
25. API - American Petroleum Institute; www.api.org/.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; https://asphaltroofing.org/.
29. ASCE - American Society of Civil Engineers; www.asce.org/.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org/.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org/.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org/.
34. ASSP - American Society of Safety Professionals (The); www.assp.org/.
35. ASTM - ASTM International; www.astm.org/.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org/.
37. AWEA - American Wind Energy Association; www.awea.org/.
38. AWI - Architectural Woodwork Institute; www.awinet.org/home.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; https://awmac.com/.
40. AWPA - American Wood Protection Association; www.awpa.com/.
41. AWS - American Welding Society; www.aws.org/.
42. AWWA - American Water Works Association; www.awwa.org/.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com/.
44. BIA - Brick Industry Association (The); www.gobrick.com/.
45. BICSI - BICSI, Inc.; www.bicsi.org/Default.aspx.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); https://bifma.site-ym.com/default.aspx.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org/.
48. CDA - Copper Development Association; www.copper.org/.
49. CEA - Consumer Electronics Association; www.cta.tech/.

50. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com/.
51. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
52. CGA - Compressed Gas Association; www.cganet.com.
53. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
54. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
55. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
56. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
57. CPA - Composite Panel Association; www.pbmdf.com.
58. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
59. CRRC - Cool Roof Rating Council; www.coolroofs.org.
60. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
61. CSA - Canadian Standards Association; www.csa.ca.
62. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csainternational.org.
63. CSI - Construction Specifications Institute (The); www.csinet.org.
64. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
65. CWC - Composite Wood Council; (See CPA).
66. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
67. DHI - Door and Hardware Institute; www.dhi.org.
68. ECA - Electronic Components Association; (See ECIA).
69. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
70. ECIA - Electronic Components Industry Association; www.eciaonline.org.
71. EIA - Electronic Industries Alliance; (See TIA).
72. EIMA - EIFS Industry Members Association; www.eima.com.
73. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
74. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
75. ESTA - Entertainment Services and Technology Association; (See PLASA).
76. EVO - Efficiency Valuation Organization; www.evo-world.org.
77. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
78. FM Approvals - FM Approvals LLC; www.fmglobal.com.
79. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
80. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
81. FSA - Fluid Sealing Association; www.fluidsealing.com.
82. FSC - Forest Stewardship Council U.S.; www.fscus.org.
83. GA - Gypsum Association; www.gypsum.org.
84. GANA - Glass Association of North America; www.glasswebsite.com.
85. GS - Green Seal; www.greenseal.org.
86. HI - Hydraulic Institute; www.pumps.org.
87. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
88. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
89. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
90. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
91. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
92. IAS - International Accreditation Service; www.iasonline.org.
93. IAS - International Approval Services; (See CSA).
94. ICBO - International Conference of Building Officials; (See ICC).
95. ICC - International Code Council; www.iccsafe.org.
96. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
97. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
98. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
99. IEC - International Electrotechnical Commission; www.iec.ch.
100. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
101. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
102. IESNA - Illuminating Engineering Society of North America; (See IES).
103. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
104. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
105. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.

106. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
107. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
108. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
109. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
110. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
111. ISO - International Organization for Standardization; www.iso.org.
112. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
113. ITU - International Telecommunication Union; www.itu.int/home.
114. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
115. LMA - Laminating Materials Association; (See CPA).
116. LPI - Lightning Protection Institute; www.lightning.org.
117. MBMA - Metal Building Manufacturers Association; www.mbma.com.
118. MCA - Metal Construction Association; www.metalconstruction.org.
119. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
120. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
121. MHIA - Material Handling Industry of America; www.mhia.org.
122. MIA - Marble Institute of America; www.mhia.org.
123. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
124. MPI - Master Painters Institute; www.paintinfo.com.
125. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.msshq.org.
126. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
127. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
128. NADCA - National Air Duct Cleaners Association; www.nadca.com.
129. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
130. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
131. NBI - New Buildings Institute; www.newbuildings.org.
132. NCMA - National Concrete Masonry Association; www.ncma.org.
133. NEBB - National Environmental Balancing Bureau; www.nebb.org.
134. NECA - National Electrical Contractors Association; www.necanet.org.
135. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
136. NEMA - National Electrical Manufacturers Association; www.nema.org.
137. NETA - InterNational Electrical Testing Association; www.netaworld.org.
138. NFPA - National Fire Protection Association; www.nfpa.org.
139. NFPA - NFPA International; (See NFPA).
140. NFRC - National Fenestration Rating Council; www.nfrc.org.
141. NHLA - National Hardwood Lumber Association; www.nhla.com.
142. NLGA - National Lumber Grades Authority; www.nlga.org.
143. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
144. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
145. NRCA - National Roofing Contractors Association; www.nrca.net.
146. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
147. NSF - NSF International; www.nsf.org.
148. NSPE - National Society of Professional Engineers; www.nspe.org.
149. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
150. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
151. NWFA - National Wood Flooring Association; www.nwfa.org.
152. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
153. PDI - Plumbing & Drainage Institute; www.pdionline.org.
154. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
155. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
156. RFCI - Resilient Floor Covering Institute; www.rfci.com.
157. RIS - Redwood Inspection Service; www.redwoodinspection.com.
158. SAE - SAE International; www.sae.org.
159. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
160. SDI - Steel Deck Institute; www.sdi.org.

161. SDI - Steel Door Institute; www.steeldoor.org.
162. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
163. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
164. SIA - Security Industry Association; www.siaonline.org.
165. SJI - Steel Joist Institute; www.steeljoist.org.
166. SMA - Screen Manufacturers Association; www.smainfo.org.
167. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
168. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
169. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
170. SPIB - Southern Pine Inspection Bureau; www.spib.org.
171. SPRI - Single Ply Roofing Industry; www.spri.org.
172. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
173. SSINA - Specialty Steel Industry of North America; www.ssina.com.
174. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
175. STI - Steel Tank Institute; www.steeltank.com.
176. SWI - Steel Window Institute; www.steelwindows.com.
177. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
178. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
179. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
180. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
181. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA – Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
182. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
183. TMS - The Masonry Society; www.masonrysociety.org.
184. TPI - Truss Plate Institute; www.tpinst.org.
185. TPI - Turfgrass Producers International; www.turfgrasssod.org.
186. TRI - Tile Roofing Institute; www.tileroofing.org.
187. UL - Underwriters Laboratories Inc.; www.ul.com.
188. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
189. USGBC - U.S. Green Building Council; www.usgbc.org.
190. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
191. WASTEC - Waste Equipment Technology Association; www.wastec.org.
192. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
193. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
194. WDMA - Window & Door Manufacturers Association; www.wdma.com.
195. WI - Woodwork Institute; www.wicnet.org.
196. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
197. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
   1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
   2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
   3. ICC - International Code Council; www.iccsafe.org.
   4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
   1. COE - Army Corps of Engineers; www.usace.army.mil.
   2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
   3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
   4. DOD - Department of Defense; www.quicksearch.dla.mil.
   5. DOE - Department of Energy; www.energy.gov.
   6. EPA - Environmental Protection Agency; www.epa.gov.
   7. FAA - Federal Aviation Administration; www.faa.gov.
   8. FG - Federal Government Publications; www.gpo.gov/fdsys.
   9. GSA - General Services Administration; www.gsa.gov.
   10. HUD - Department of Housing and Urban Development; www.hud.gov.
   11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.

12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.
   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

SECTION 01 43 39
MOCKUPS

PART 1 – GENERAL

1.1. SUMMARY

A. Definition
   1. Mockups are field samples constructed, applied, or assembled at the project site for review by the Owner, Owners Representative, Architect and Consultants.
   2. 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.
   1. All plans, specifications, and details including those derived as revisions (RFI, CB, CO).
   2. 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.
   3. 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:
   1. Designating the location for the mockup construction
   2. Coordinating the work of all contractors and materials required to complete the mockup
   3. Ensuring that the mockup meets the intent of the construction documents before scheduling the mockup review meeting.

PART 2 - PRODUCTS

2.1. MATERIALS

A. The materials used in mockups shall be only those materials indicated in the plans, specifications, and favorably reviewed submittals.

B. Mockups shall be made of full scale materials as delivered to the project site.

C. All materials associated with a particular detail, construction method, manufacturer's installation instructions shall be properly represented and visible in the mockup. This includes but is not limited to finished mortar joints, sealants, backer rods, tie bars, rebar, etc.

PART 3 - EXECUTION

3.1. REVIEW THE PLANS AND SPECIFICATIONS

A. The GC shall review the plans and specifications with all required contractors prior to constructing the mockup.

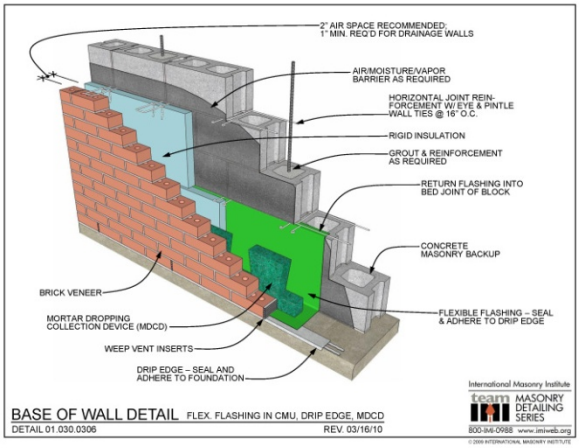
1. Mockups that will be built and remain in place, if favorably reviewed, will be installed in an area easily accessible for review.
2. Mockups that will not be built in place or will not remain will be constructed in a space on the project site protected from weather, construction traffic, and other such disturbances until such time as the associated work has been completed.
3. Insure all products being represented in the mockup meet the plans, specifications, and any published changes.

3.2. MOCKUP CONSTRUCTION

A. Mockups shall be of sufficient size to show various material adjacencies, connectivity, patterns, and other such related features.

B. Mockups shall be constructed in a layered fashion so that all products being used can be seen and evaluated.

C. The construction detail below is an example of a properly layered mockup.



d. Mockups shall be constructed for all cavity wall construction and all hidden elements of construction.

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.

END OF SECTION

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SECTION 01 43 50
AIR BARRIER SYSTEMS

PART 1 – HEADING 1

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

A. Contractor will engage a qualified consultant(s) to perform tests and inspections prior to the installation of air barrier components.

B. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration or exfiltration of air.

C. Related Sections:

1. Section 07 25 00: Weather Barriers.
2. Requirements of this section relate to the coordination between subcontractors required to provide an airtight building enclosure, customized fabrication and installation procedures, not production of standard products.

1.3. DEFINITIONS

A. Air Barrier System: The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the building enclosure.

B. Services: Include coordination between the trades, the proper scheduling and sequencing of the work, pre-construction meetings, inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

1.4. PERFORMANCE REQUIREMENTS

A. General Performance: The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The air barrier system shall have the following characteristics:

1. It shall be continuous, with all joints sealed.
2. It shall be structurally supported to withstand positive and negative air pressures applied to the building enclosure.
3. Continuity of the air barrier materials and products with joints to provide complete assemblies.
4. Continuity of all the enclosure assemblies with joints and transition materials to provide a whole building air barrier system.

B. Connection shall be made between:

1. Foundation and walls.
2. Walls and windows or doors.
3. Different wall systems.
4. Wall and roof.
5. Wall and roof over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.

7. Walls, floors and roof to utility, pipe and duct penetrations.

C. Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be made air-tight.

D. Compliance Requirements:

1. Assemblies: an air permeance not to exceed 0.03 cfm/ft2p under a pressure differential of 0.3 in. water (1.57psf) (0.15 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 1677.
2. Materials: Materials used for the air barrier system in the opaque envelope shall have an air permeance 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) when tested in accordance with ASTM E 2178. Or,
3. Entire Building: The air leakage of the entire building shall not exceed 0.15 cfm/sf under a pressure differential of 0.3 in. water (1.57psf) (0.75 L/s.m2 @ 75 Pa) when tested according to ASTM E 779.

1.5. SUBMITTALS

A. Field quality-control reports.

B. Testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

C. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

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

1.6. QUALITY ASSURANCE

A. General Performance: The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of the conditioned space is achieved. The air barrier system shall have the following characteristics:

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

1. Qualifications for Air Barrier Testing and Inspection Agencies: Engage Air Barrier inspection and testing service agencies, including independent testing laboratories, that are prequalified and that specialize in the types of air barrier system inspections and tests to be performed.

C. Specific quality-control requirements for individual construction activities are specified in the sections of the specifications. Requirements in those sections may also cover production of standard products. It is the Contractor’s responsibility to ensure that each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each section.

D Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.

1.7. PROJECT CONDITIONS

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

Documents and required by authorities having jurisdiction or by the Owner. Costs for these services are included in the Contract Sum.

B. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.

C. Build a mock-up before proceeding with the work, satisfactory to the Architect, of each airtight joint type, juncture, and transition between products, materials and assemblies.

D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
   1. Provide access to the Work.
   2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
   3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
   4. Deliver samples to testing laboratories.
   5. Provide security and protection of samples and test equipment at the Project Site.

E. Duties of the Testing and Inspection Agency: The independent agency engaged to perform inspections, sampling, and testing of air barrier materials, components and assemblies specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
   1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
   3. The agency shall not perform any duties of the Contractor.

F. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
   1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

PART 2 – PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1. FIELD QUALITY CONTROL

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

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

n. Connections between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
o. All penetrations sealed.

2. ASTM E 1186/98 “Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems.”
   a. Infrared scanning with pressurization/depressurization.
   b. Smoke pencil with pressurization/depressurization.
   c. Pressurization/depressurization with use of anemometer.
   d. Generated sound with sound detection.
   e. Tracer gas measurement of decay rate.
   f. Chamber pressurization/depressurization in conjunction with smoke tracers.
   g. Chamber depressurization using detection liquids.

3. Quantitative Tests: Provide written test reports of all tests performed, with copies to the Owner, Contractor and Architect.
   a. Material compliance for maximum air permeance, ASTM E 2178.
   b. ASTM E 283, Determining rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
   c. Assemblies, ASTM E 1677, test pressure and allowable air leakage rate to be determined by design professional for interior design conditions and location of project.
   d. CAN/CGSB 1986 Standard 149.10, Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method.
   e. CAN/CGSB 1996 Standard 149.15 Determination of the Overall Envelope Airtightness of Office Buildings by the Fan Depressurization Method Using the Building’s Air Handling System.
   f. Canadian National Master Specification Sections 07272 Air Barrier Systems for Exterior Walls of Low-Rise Buildings.
   g. Canadian National Master Specification 07272.1 : Durability Assessment of Bead-Applied Urethane-Based Sealant Foam for Air Barriers.
   h. Whole building, floors, or suites, ASTM E779, Determining Airtightness of Buildings Air Leakage Rate by Single Zone Air Pressurization.
   i. Windows and connections to adjacent opaque assemblies, ASTM E783.
   j. Tracer gas testing, ASTM E741.
   k. Pressure test, ASTM E330.
   l. Bond to substrate, ASTM D4541-95.
   m. Minimum dry or wet film thickness for liquid-applied materials are per the manufacturer’s requirements.

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.

END OF SECTION

SECTION 01 45 16
FIELD QUALITY CONTROL PROCEDURES

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 Progress Management Web Site is a Construction Management tool that provides contractors 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".
      a. By using the QMO process the City of Madison's goal is to have a zero item punch list prior to the 90% progress payment and owner occupancy.

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.

C. It is the intent of this specification to outline the requirements, expectations, and responsibilities of the General Contractor (GC), Project Architect, and other representatives of the Owner for items of Quality Assurance and Quality Control.
   1. This specification is not intended to conflict with Specification 01 40 00 Quality Requirements or other specifications requiring testing and inspecting services.
   2. This specification does not relieve the GC from any requirements associated with regulatory inspections performed by the City of Madison Building Inspection Unit, or inspectors from other agencies as required by code.
   3. Any testing performed by an Owner's Representative does not relieve the GC from performing any testing that may required by the construction documents.

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. PERFORMANCE REQUIREMENTS

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

B. The GC shall be responsible for all of the following:
   1. Monitor the quality of all workmanship, supplies, materials, and products being installed by all contractors and installers to ensure they meet or exceed the minimum requirements set forth by the construction documents.
   2. Submit a Request for Information (RFI) whenever manufacturers' instructions or referenced standards conflict with the construction documents before proceeding with the Work.
   3. Ensure that Work requiring special certifications or licensing is being performed by is being performed and supervised by personnel that meet the appropriate requirements.
      a. Ensure that all certificates and licenses are current throughout the execution of the project.

C. The CoM and its representatives shall perform quality assurance and quality control activities throughout the execution of this project. This in no way relieves the GC of maintaining an acceptable QA/QC program. =

1.4. QUALITY ASSURANCE

A. The GC shall be responsible for the following:
   1. All materials, equipment, and products shall be new, clean, undamaged, and meet the performance specifications defined within the construction documents including favorably reviewed submittals.
      a. Any material, equipment, or product that does not meet the requirements of the construction documents shall be removed and replaced, including any adjacent and related work, at the GCs expense.
   2. All Work shall be performed by persons properly trained and/or qualified to produce workmanship of the quality specified in the construction documents.
   3. Providing access to updated as-builts, addenda, submittals, bulletins and other related construction documents at the project site.

B. The CoM and its representatives may be responsible for any of the following:
   1. Attend pre-installation meetings
   2. Attend construction progress meetings
   3. Review all submittals
   4. Conduct field visits for QA/QC purposes, provide feedback to the GC and sub-contractors using Quality Management Observation (QMO) reports.
   5. Review delivered equipment
   6. Witness equipment installations, startups, testing as specified in other specifications

1.5. QUALITY MANAGEMENT OBSERVATION REPORT

A. The Quality Management Observation report or QMO is used as a QA/QC tool by those entities responsible for QA/QC activities, including but not limited to, the GC, CoM, PA, CX agent, etc.

B. QMOs are designed to be an early observation of non-conforming construction work before it becomes buried by follow on work. As such it is most often used as an "in progress punch list".

C. QMO forms are part of the Quality Control Library on the Project Management Web Site.

PART 2 – PRODUCTS - THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. QUALITY MANAGEMENT RESPONSIBILITIES

A. While making routine progress visits to the construction project the GC, CPM, CxA and A/E, and applicable others shall observe the details of the construction and installations to ensure that the intent of the construction documents is being followed.

B. If during the progress visit there is a determination of contract non-conformance a QMO report shall be initiated to begin the documentation process.
   1. The GC field superintendent shall be informed immediately of any issue that may cause harm, damage to finished work, or be buried prior to properly filing a QMO report.

C. The following information when filing a QMO report:
   1. Open a QMO report in the Quality Control Library on the Project Management Web Site
   2. Enter the date and time of the field visit
   2. Provide references to construction documents if any (examples; specification, drawing page, details, approved submittals, RFI, CB, etc)
   3. Provide a short title for the observation being made
   4. Provide a detailed description of the observation being made

5. Select all categories (Sitework, Structure, Enclosure, Interior, etc) from the given list that may apply to the observation being reported.
    a. For each category selected additional boxes shall open with contractor names associated with each category.
6. Select all contractors from the lists provided that may need to be aware of the observation.
7. Provide any attachments that may help provide reference to the observation.
8. Click the SAVE button before closing the form.

D. The software for the Project Management Website will email notifications that a QMO report has been initiated. The software will automatically select and notify the following:
1. The GC, PA, and CPM for all observation reports being filed.
2. Others depending on the observation categories selected.
3. Contractors based on the selections made in the sub-contractors lists.

3.2. RESPONDING TO A QMO

A. All contractors receiving email notification of a QMO Observation shall review the details of the observation.
B. The GC shall be responsible for determining the course of action required to remedy the non-conforming issue and shall coordinate and direct the contractor(s) responsible for any work related to the observation.
C. All contractors assigned to remedy the observation by the GC shall provide follow-up responses on the QMO report as follows:
1. Open the QMO report in the Quality Control Library on the Project Management Web Site.
2. In the “Follow-Up Response” area enter a description of your follow-up response in the box provided.
    a. Click “Insert Item” if additional boxes are required.
3. Add attachments (pictures) if needed to show the work has been completed.
4. Click the SAVE button before closing the form.

3.3. GENERAL CONTRACTORS FOLLOW-UP

A. The GC shall inspect the work to ensure that all assigned contractors have remedied the observation to the intent of the construction documents.
B. The GC shall respond with any additional comments in his/her response box.
1. If no comments are to be made the GC at a minimum must date the response box to trigger the next work flow.
C. Click the SAVE button before closing the form.
D. The software will email a notification to the CPM and the person who initiated the QMO that the issue has been remedied.

3.4. QMO CLOSEOUT PROCEDURE

A. The person who initiated the QMO shall review the remedied work and if properly corrected shall close and date the QMO form.
1. Click SAVE and the software will email a notification to the CPM that final review of the Observation is required.
2. In the event there are still issues the Quality Manager can add additional comments in the response area, click SAVE and re-issue the QMO for additional review as needed.
B. Once the person who initiated the QMO has closed the item the CPM shall review and verify with the PA that the Observation has been properly remedied and provide final closure on the QMO.

3.5. CONSTRUCTION CLOSEOUT

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

END OF SECTION

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SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.1. REQUIREMENTS INCLUDED

A. The Contractor shall employ and pay for the services of an independent testing laboratory to perform specified services and testing.

B. Testing Laboratory inspection, sampling and testing is required for:

1. Section 03 30 00: Cast-In-Place Concrete
2. Section 05 12 00: Structural Steel Framing
3. Section 05 40 00: Cold-Formed Steel Framing
4. Section 31 20 00: Earthwork

1.2. RELATED REQUIREMENTS

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

B. Related Requirements Specified in Other Sections:

1. Division 22 and 23: Testing of Mechanical Systems
2. Division 26: Testing of Electrical Systems

1.3. QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements of Independent Laboratory Qualification" published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."

C. Authorized to operate in State in which the Project is located.

1.4. LABORATORY DUTIES

A. Cooperate with Owner, A/E and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specified standards.
2. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify the Owner, A/E and Contractor of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test and inspection; one copy each to A/E, Consulting Engineer, Owner and Contractor. Each report shall include:

1. Date issued.
2. Project Title and number.
3. Testing laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of product and specification section.
9. Location of sample or test in the Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.

12. Interpretation of test results, when requested by A/E or the Contractor.

E. Perform additional tests as required by Owner, A/E or the Contractor.

1.5. LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:
1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Approve or accept any portions of the Work other than those portions of the Work scheduled for testing.
3. Perform any duties of the Contractor.

1.6. CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work and to manufacturer's operations.

B. Secure and deliver to the laboratory, adequate quantities of representative samples of materials proposed to be used and which require testing. Submit concrete mix designs to A/E for approval prior to pouring concrete.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes that require control by the testing laboratory.

D. Furnish copies of Product test reports as required.

E. Furnish incidental labor and facilities:
1. To provide access to Work to be tested.
2. To obtain and handle samples at the Project site or at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

G. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience.

H. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required when initial tests indicate work does not comply with Contract Documents.

I. Temporarily halt the progress of the Work when tested materials do not comply with Contract Documents and promptly notify the Owner or his designated representative and A/E.

J. Remove and replace at no cost to the Owner, all defective materials discovered upon testing not to comply with Contract Documents, including cost for retesting and re-inspecting replaced Work that failed to comply with the Contract Documents.

1.7. SPECIFIC TEST, INSPECTIONS, AND METHODS REQUIRED

A. **Section 03 30 00: Cast-In-Place Concrete**
1. Secure sample of aggregates Contractor proposes to use and test for compliance with Specifications.
2. Certify compliance with Specifications of cement proposed for use by the Contractor.
3. Review and approve the Contractor's proposed concrete mix proportions for the required concrete strengths using materials Contractor proposed to use on the project. Incorporate specified admixtures and not less than amounts of cement specified.
4. Perform appropriate laboratory tests, including compression tests of cylinders and slump test to substantiate mix designs.
5. Inspect and test materials during concrete work to substantiate compliance with Specifications and mix requirements.
a. Testing:
i. Sample and test concrete in accordance with ASTM C 31, ASTM C 143, ASTM C 172, and ASTM C 231.
ii. Perform slump tests in accord with ASTM C 143 from same concrete batch used for test cylinders and record results and comments on compression test reports.
iii. Perform compression tests in accordance with ASTM C39.
iv. When air-entrained concrete is used, a minimum of one (1) air content test shall be performed in accordance with ASTM C 231 for each set of test cylinders taken.
v. Identify all test cylinders with symbols to indicate location on the job where concrete test was made. Record on project record drawings.
vi. Strength tests shall be made for: each day's pour; each class of concrete; each change of 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.

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION – THIS SECTION NOT USED

END OF SECTION

SECTION 01 45 34

QUALITY CONTROL FOR EXTERIOR WALL SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies procedures for quality control testing of exterior wall systems. Types of testing specified in this Section include:
   1. Laboratory testing of exterior wall assemblies.
   2. Field testing of exterior wall assemblies.

B. The requirements of Section 014000, Quality Requirements, apply to this Section.

1.2 DEFINITIONS

A. Water leakage, as defined in this specification and applicable to all sections, is any water that appears on any normally exposed interior surfaces, or uncontrolled water that is not contained or positively drained back to the exterior, or water that can cause damage to adjacent materials, wall components or finishes. Water contained within drained flashings, gutters, and sills and is positively drained to the exterior is not considered water leakage.

1.3 MOCKUP SUBMITTALS

A. Test Procedure Submittal: Submit laboratory's proposed test procedure. Erection at testing laboratory is not to commence prior to review of laboratory's proposed test procedure by Architect.
   1. Shop Drawings for Exterior Wall Systems: Submit mockup Shop Drawings prior to fabrication and testing of mockup unit. Shop Drawings shall be signed and sealed by a structural engineer licensed in the State of Wisconsin.

B. Show plans, elevations and details, including thickness of metals and glass, methods of glazing, methods of anchoring, fastening and jointing, finishes of materials, perimeter sealants and other pertinent data and information.

C. Structural Calculations: Submit a complete set of structural calculations, stamped by a structural engineer licensed in the State of Wisconsin. Calculations are to demonstrate that the scope of the mockup and the results of the testing caused by the structural loads which are to be applied to the mockup will accurately represent the results and reactions which can be anticipated on the project.

D. Upon completion of testing, the Contractor is to immediately provide "as-built" mockup drawings showing any modifications or additions required to meet the performance requirements.

E. Final review of shop drawings will be given only after test mockup has been tested and approved.

1.4 COSTS OF TESTS

A. Laboratory Tests:

1. The cost of the testing Laboratory only (not set-up charges) for the first series of tests will be paid for by the Owner. Set-up charges (construction of mockup) are to be paid by the Contractor.
2. In the event that failures necessitate retesting, the Contractor is to pay the additional laboratory fees and any fees and expenses incurred by the Owner, Architect, and Consultants, as a result of retesting.
3. The Contractor is liable for any failure of its work to meet test requirements without adjustment to the Contract Sum or the Contract Schedule.

B. Field Tests:
1. The Contractor is to pay set-up costs for these tests. The Owner will retain an independent testing agency to conduct and witness the field tests.
2. The Contractor is responsible and is to pay all costs of remedial work and subsequent retesting should test fail.
3. The Contractor is to furnish all necessary labor for conducting tests, and all necessary equipment such as scaffolding, approved shop drawings, and any other required equipment in order to accurately test the specimen.
   a. Testing agency will provide chambers, hose racks, garden hoses, nozzles, two-way communication between exterior and interior, flashlights and any other required equipment in order to accurately test the specimen.
4. The Contractor is to provide whatever equipment or plumbing as necessary to provide the proper water pressure for conducting the test. The source of water is to be of sufficient amount to insure ample water for conducting the tests.
5. Provide the following tests:
   a. Conduct 2 separate chamber tests at 10 percent complete.
   b. Conduct 2 separate chamber tests at 50 percent complete.
   c. Conduct 3 separate hose tests at 90 percent complete.
6. Contractor and subcontractor is to have knowledgeable personnel present at all times at all tests.

1.5 TEST REPORTS

A. Include in test reports; date of test and date of report, identification of the specimen (manufacturer, source or supply, dimensions, model, type, materials, and other pertinent information). Provide photographic documentation of test specimen and locations of any failures.

B. The testing laboratory will inspect the specimen and report all noted deviations to the mockup shop drawings.

C. Air Infiltration: For Air Infiltration under Uniform Static Air Pressure, include a statement or tabulation of the pressure difference exerted across the specimen during the test and the corresponding rate of air leakage for each specimen tested, calculated in accordance with ASTM E 283. Each element of the exterior wall is to be tested independently, i.e. fixed area, operable window, door, etc.

D. Water Penetration: For Water Penetration under Uniform Static Air Pressure and Dynamic Air Pressure, include:
1. A statement or tabulation of pressure difference or difference exerted across the specimen and water application rates during the test. For the dynamic test a statement of the engine speed (rpm) and air stream velocity (mph).
2. A record of all points of water penetration on the indoor face of the test specimen, and of water leakage.

E. Structural Performance: For structural performance under uniform static air pressure difference, include:
1. A tabulation of pressure differences exerted across the specimen during the test and the deflections and permanent deformations at locations specified for each specimen tested.
2. The duration of test loads.
3. A record of visual observations of performance.
4. When the tests are made to check conformity of the specimen to a particular specification, an identification or description of that specification.
5. A statement that the tests were conducted in accordance with this method, or a full description of any deviations from this method
6. A statement as to whether or not tape or film, or both, were used to seal against air leakage, and whether in the judgment of the test agency, the tape or film influenced the results of the test
7. If several essentially identical specimens of a component are tested, report results for all specimens, each specimen being properly identified, particularly with respect to distinguishing features or differing

adjustments. A separate drawing for each specimen will not be required if all differences between them are noted on the drawings provided.

F. The testing laboratory is responsible for conducting and reporting the tests, state in the report whether or not the test specimen conforms to all requirements of the Contract Document's approved drawings, and specifically note any deviations therefrom.

G. The testing laboratory is to submit its report directly to the Architect. Necessary corrections are to be performed in the presence of the Architect and/or Owner's Consultant. Pre-testing for air infiltration, not water penetration, is acceptable. All tests will be witnessed by the Architect and/or Owner's Consultant.

PART 2 – PRODUCTS

2.1 LABORATORY EXTERIOR WALL ASSEMBLY MOCKUP CONSTRUCTION

A. Arrange for the erection of a test chamber at an approved testing laboratory, including simulated structural supports suitable for the construction of mockups of the exterior wall construction of the size and configuration indicated. Construct mockups by the same Installers that will perform the actual construction.

B. Construct full size Mockup as shown on Architectural Drawings. Provide scope of mockup to allow for mockup to accurately demonstrate that wall design is in compliance with the performance requirements.

C. Transport preassembled components to the testing facility in the same manner as they are to be transported in the actual project conditions.

D. Provide mockups complete with corners, splice joints, sealants, glass and glazing, anchors and complete finish with all details complete and identical to those proposed for use in the building.

1. Furnish, build, and test a mockup containing the glazed unitized window wall, glazing, and window washing tie-ins. Provide mockup which accurately represents the job conditions including joints, sealants, glass, glazing, anchors and finishes. Install sufficient thermal insulation to demonstrate details of installation. Delay installation of thermal insulation until completion of initial air, water and structural tests.
2. Install accessory items which could affect performance of exterior wall systems, including window washing tiebacks and light fixtures.
3. Provide at least one extra light of glass for each type and size on the mockup. Replace glass that breaks during testing with new glass and continue testing. Repeated glass breakage at design pressures constitutes failure.
4. Construct mockups in strict accordance with reviewed mockup shop drawings. Any deviation from or additions to details shown on drawings are subject to approval.
5. Do not use excessive amounts of sealant, nor other special measures or techniques, which are not representative of those to be used on the building.
6. Finish the various components to show the maximum variation that will exist in the actual building construction between adjacent and non-adjacent components.
7. At the direction of the Architect deliver mockup or selected portions of the mockup, boxed to the job site, contractors plant, or dispose of mockup properly.
8. Mockups are subject to observation by Owner, Architect and their Consultants throughout their construction and testing. Provide minimum three weeks notice before beginning construction of mockup. Provide materials and personnel for prompt continuous construction of mockups. Delays in mockup construction due to lack of materials or personnel could result in the Contractor being charged for fees and travel expenses of observers. Contractor is to coordinate chamber availability, shipping schedules and mockup construction schedules directly with the laboratory.
9. If failures occur, revise and retest mockup. Modifications must be realistic in terms of job conditions, must maintain standards of quality and durability, and are subject to approval.

E. Set up and make complete, installation of mockups at off-site location. Mockups will be used to demonstrate quality of materials, finish and workmanship as well as to show compliance with performance criteria. Upon completion of satisfactory tests, dismantle mockups. Crate and deliver to job site, Contractor's plant or dispose of as directed.

F. Sealant Compatibility Coordination: Prior to mockup installation or fabrication, provide to sealant manufacturer samples of all relevant substrates, including finished aluminum, coated glass, gaskets, stone, backers and any other substrates which will require sealant contact. Label and identify samples for this project. Provide sealant manufacturer perform tests results to verify adhesion, staining and chemical

compatibility. Use sealants and substrates only in combinations for which favorable adhesion and compatibility results have been obtained. Submit for record sealant manufacturer's written test reports, and recommendations regarding cleaning and priming required to obtain acceptable adhesion.

G. Window Washing Tieback Coordination: Prior to mockup installation submit the window washing tie-in retention mechanisms to be used on the project to the laboratory so the actual complete assembly can be tested.

H. Testing will be performed at one of the following facilities, selected by the Owner:
   1. Construction Research Laboratory, Inc., Miami, FL.
   2. Construction Consulting Laboratory, Carrollton, TX.
   3. Mid-America Testing Lab, St. Louis, MO.
   4. Quast Consulting and Testing, Inc., Mosinee, WI.

I. Allow sufficient time for all chemically curing sealants to achieve their proper cure as recommended by the manufacturer.

PART 3 – EXECUTION

3.1 EXTERIOR WALL ASSEMBLY TESTING PROCEDURES

A. The uniform air pressure difference test procedures specified in ASTM E 283, ASTM E 331 and ASTM E 330 are to be used to evaluate air infiltration, water penetration and structural performance respectively.

B. After the test specimen has been installed in the test chamber, but before any tests are conducted, subject the specimen to a static air pressure differential equal to 50 percent of the specified maximum test load acting against the outdoor side of the test specimen. Maintain this load for a minimum of 10 seconds and then removed.

C. Perform testing in the following order:
   1. Open and close doors and windows 50 times each.
   2. Operable force of vent hardware per ASTM E 2068 for compliance with accessibility requirements and operating force of door hardware.
   3. Preload.
   4. Air infiltration static method.
   5. Water penetration static method.
   6. Water penetration dynamic method.
   7. Structural deflection at design wind load.
   8. Window washing tie-in.
   9. Repeat air infiltration static method.
   10. Repeat water penetration static method
   11. Repeat water penetration dynamic method.
   12. Inter-story movement.
   13. Repeat air infiltration static method
   14. Repeat water penetration static method
   15. Repeat water penetration dynamic method
   16. Air infiltration static method.
   17. Water penetration static method.
   18. Water penetration dynamic method.
   19. Structural test at 1.5 times design load.
   20. Window washing tie-in at ultimate load.

D. Test Apparatus and Calibration:
   1. Provide apparatus used for conducting air infiltration, water penetration and structural performance tests by uniform static air pressure difference meeting the requirements of ASTM E 283, ASTM E 331 and ASTM E 330 respectively and calibrated as prescribed therein.
   2. Provide apparatus used for conducting water penetration tests by dynamic pressure meeting the requirements of AAMA 501.1 and calibrated as prescribed therein.

E. Assembly Testing:
   1. Air Infiltration: Conduct ASTM E 283 test for air infiltration at an air pressure difference of 6.24 psf. Maximum allowable rate of air infiltration must not exceed the following. Measure and record the air flow through each component of the wall system.

a. Fixed Wall Areas: 0.06 cfm per sq ft.
b. Operable Windows: 0.10 cfm per lin ft.
c. Terrace Doors: 0.10 cfm per sq ft
d. Sliding Glass Doors: 0.30 cfm per sq ft.

2. Water Penetration:
   a. Conduct ASTM E 331 test for water penetration at an air pressure difference equal to 15.0 12.0 psf. There is to be no water leakage at this pressure difference.
   b. Conduct AAMA 501.1 test for water penetration under dynamic air pressure with an air stream equivalent to a static air 15.0 12.0 psf. There is to be no water leakage at this dynamic air pressure.
   c. Where the test sequence or test failures requires successive water infiltration tests, the only means used to drain water from internal cavities is to be gravity drainage through the weep system for a minimum of 15 minutes. Air pressure, removal of parts, or other means of draining water is not to be used.
3. Structural:
   a. Conduct ASTM E 330 test for structural performance at a 45 psf positive and negative 60 psf negative design wind pressures. Include additional test at 1.50 times positive and negative maximum design loads.
   b. Deflection of any metal framing member supporting glass in a direction normal to the plane of the wall, is not to exceed the following:
      i. Spans up to 13 ft - 6 inches: Limited to 1/175 of clear span
      ii. Spans greater than 13 ft - 6 inches and less than 40 ft: Limited to 1/240 of clear span plus 1/4 inch.
      iii. No glass breakages, sealant failure, disengagement of trim or accessories, or anchor movement in excess of 1/16 inch is allowed at design load.
   c. No permanent damage to panels, fasteners or anchors, is to occur and permanent deformation to wall framing members is not to exceed 0.2 percent of their clear spans at a structural test load equal to 1.5 times the specified positive and negative design wind pressures.
   d. Window washing tie-in tests to be conducted at design loads with a negative pressure of 6.24 psf applied uniformity to the wall surface. Apply loads in direct pull out, lateral left and lateral right and downward parallel to the wall. No failure of pins, supports, lanyards or sealants is to occur at design loads. Design loads to be 150 lbs of pull. Safety factor loads are to be 600 lbs of pull. There is to be no disengagement of lanyards, pins, or failure of supports during safety factor loads. Sealant failure is acceptable during safety factor loads. Hold loads for 10 seconds.

F. In the event of failure to initially meet the test requirements called for herein above, the Contractor and respective subcontractors are required to, redesign, rework, and/or re-fabricate, re-ship and re-erect and retest mockup assemblies until said requirements are met, at no additional cost to the Owner, or delay in project schedule.

3.2 FIELD TESTING FOR WATER LEAKAGE

A. After completion of unitized window wall installation and related glazing, and prior to installation of interior finishes, test in accordance with AAMA 501.2 "Field Check of Metal Curtain Walls for Water Leakage", except that Architect may designate all storefront or any portion for testing.

B. Field Test Procedure: As follows, in accordance with AAMA A501.2:
1. Starting at the bottom of the prepared area, remove the masking tape from the lowest horizontal joint for a distance of not more than 6 feet - 0 inch from one end of the joint, including the joint intersection or corner at that end. This exposed length is to be subjected to the nozzle spray from a 3/4-inch garden hose.
2. The nozzle to be used is to be a type B-25, #6.030 brass nozzle, with 1/2-inch NPT, as manufactured by Monarch Manufacturing Works, or other as approved by the Architect.
3. Use the nozzle with a 3/4-inch Garden Hose and provide a control value between the hose and the pressure gauge and a pressure gauge between the value and the nozzle. Adjust the water flow to the nozzle by the control value to produce a 30 to 35 psi water pressure at the nozzle inlet.
4. With the water directed at the joint and perpendicular to the face of the wall, move the slowly back and forth along the joint, at a distance of 12 inches from it, for a period of 5 minutes, for 5 ft of joint. Observers from an independent laboratory, or the Owner's consultant, or the Architect will inspect on

the indoor side of the wall for any leakage and note where it occurs. Inspectors will use a flashlight and magnifying glass or mirrors if necessary, to inspect for leaks.

5. If no leakage occurs during the 5-minute test period, this length of joint is considered satisfactory. The next five feet of joint will be wetted for five minutes and testing continued until entire test area is covered.
6. If leakage has occurred at any point, the joint is to be re-taped at such points to prevent further leakage during the subsequent checking of joints adjacent to or above it.

C. This process is to then be repeated on all joints and joint intersections within the designated area, using increments of exposed joint length not exceeding 6 feet – 0 inch and always working upward on the wall.

D. In some cases, due to unforeseen delays or other causes, more than one working day may be required to completely check the designated area, necessitating that some or all of the masking tape be left in place over night. The tape is not to remain on finished metal surfaces any longer than necessary, however, especially where subjected to strong sunlight, as this may make its removal difficult and may also cause staining. In no case is the tape to be left in place more than 48 hours.

E. Remedial Work and Re-Checking: Wherever leakage has occurred, joints are to be made watertight in a manner acceptable to the Architect.

1. Remedial work involving the use of curing-type compounds is to be allowed to set and cure for one week before it is re-checked for leakage.
2. After all necessary remedial work has been completed, and the required curing time, if any, has elapsed, check repaired joints again, following the same procedure as stated herein before.
3. Should leakage still be found, take further remedial measures and checking will be repeated until all joints in the designated area are found to be satisfactory.

3.3 FIELD PORTABLE CHAMBER TESTS FOR AIR AND WATER PENETRATION BY UNIFORM STATIC AIR PRESSURE DIFFERENCE

A. This test will be performed by an independent laboratory, selected and retained by the Owner.

B. This field testing is intended to confirm the performance of the installed external wall for air and water infiltration.

C. If operable joints such as those around doors and operable parts of windows occur within the wall area involved, appropriate modifications both of procedure and performance requirements should be made in respect to such joints.

D. Satisfactory results of this test do not in any way relieve the Contractor from conforming to all requirements of the Contract Documents, shop drawings, project specifications. Installation of the work on the remainder of the building is to be done exactly as in the area checked unless otherwise instructed in writing.

E. All such remedial measures as are found necessary and effective in eliminating leakage in the area checked are to be used in fabricating and/or installing all of the remainder of the wall on the building.

F. Preparation of Wall:

1. All of this work is to be done in strict accordance with approved shop drawings and specifications. No extra sealants or special installation methods are to be used in this area which are not part of the typical wall installation.
2. No pretesting of prepared area is permitted.
3. The Architect will then designate an area of completed wall, minimum 15 ft in width and one story in height to be tested.

G. Field Test Procedure: In accordance with AAMA A501.3.

1. Conduct tests for air infiltration at an air pressure difference of 6.24 psf. Maximum allowable rate of air infiltration may not exceed the following:
   a. Fixed Wall Areas: 0.06 cfm per sq ft.
   b. Operable Windows: 0.10 cfm per lin ft.
   c. Terrace Doors: 0.30 cfm per lin ft.
2. Conduct tests for water penetration at an air pressure difference equal to 12.0 psf. There is to be no water leakage at this pressure difference.

H. Conduct test procedures as specified in Paragraph 1.4.B in this section.

I. If failures occur, additional testing will be required. Quantities and location to be determined by the Architect. All costs associated with additional testing to be borne by Contractor.

J. All tests to be performed in the presence of the Architect, unless directed otherwise.

1 **END OF SECTION**

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

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

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities".

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

1.4. TEMPORARY UTILITIES

A. Contractor will provide the following:

1. Electrical power and metering for construction.
2. Water supply for construction.
   a. Use trigger-operated nozzles for water hoses, to avoid waste of water.

E. Temporary Lighting: Electrical Contractor shall provide temporary lighting with local switching

1. Install and operate temporary lighting, minimum of 30 fc, to fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for all areas of work, including construction operations and traffic conditions.

F. Temporary Heat: General Contractor shall provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

1. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
   a. Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

1.5. TELECOMMUNICATIONS SERVICES AND WI-FI

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization through construction closeout.

B. Telecommunications services shall include:

1. Windows-based personal computer dedicated to project telecommunications.
2. Shared access to the internet via WIFI or similar wireless connection.
   a. Access must be capable to support minimum of 10 wireless devices.
3. Email Account/address dedicated for GC Project Manager of GC Supervisor on site.

1.6. TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Temporary toilets: Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials foreach facility. Provide covered waste containers for used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.

C. Maintain daily in clean and sanitary condition

D. Water: Provide potable water approved by local health authorities

1.7. BARRIERS

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

1.8. FENCING

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

1.9. EXTERIOR ENCLOSURES

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

1.10. SECURITY

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

1.11. VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
B. Coordinate access and haul routes with governing authorities and Owner.
C. Provide and maintain access to fire hydrants, free of obstructions.

1.12. WASTE REMOVAL

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

1.13. PROJECT IDENTIFICATION

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

1.14. FIELD OFFICES

A. Office: Weather tight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
B. Field Office shall be located on the project site.
C. Provide space for Project Meetings with table and chairs to accommodate a minimum of 15 persons.
D. Provide a minimum of a 40” LCD monitor or other digital projection device to be connected to the computer identified in Section 1.4 Telecommunications Services (above), for use during progress meetings in connection with reviewing construction progress information posted to the Project Management Web Site (Specification 01 31 23) hosted by the Owner.

PART 2 - PRODUCTS

2.1. TEMPORARY PARTITIONS

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

2.2. EQUIPMENT

A. Temporary Lifts and Hoists: Contractors requiring temporary lifts and hoists shall provide facilities for hoisting materials and employees.
B. Electrical Outlets: Electrical Contractor shall provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
C. Electrical Power Cords: Contractors requiring power cords shall provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
D. Lamps and Light Fixtures: Electrical Contractor shall provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
E. Heating Units: General Contractor shall provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.
F. First Aid Supplies: General Contractor shall provide first aid supplies complying with governing regulations.

G. Fire Extinguishers: General Contractor shall provide hand-carried, portable UL-rated, fire extinguishers of NFPA recommended classes for the exposures, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1. TEMPORARY FIRE PROTECTION

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

3.2. COLLECTION AND DISPOSAL OF WASTE

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

3.3. ENVIRONMENTAL PROTECTION

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

3.4. REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

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

END OF SECTION

SECTION 01 57 19.11

INDOOR AIR QUALITY (IAQ) MANAGEMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Special requirements for Indoor Air Quality (IAQ) management during construction operations.
      a. Control of emissions during construction.
      b. Moisture control during construction.
   2. Procedures for testing baseline IAQ. Baseline IAQ requirements specify maximum indoor pollutant concentrations for acceptance of the facility.

B. Related Sections:
   1. 01 40 00 – Quality Requirements: Meetings and project coordination.

1.2 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114.

B. Adequate ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.
   1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

E. Interior final finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.

F. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.

G. Wet products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

1.3 SUBMITTALS

A. Indoor Air Quality (IAQ) Management Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an IAQ Management Plan including, but not limited to, the following:
   1. Procedures for control of emissions during construction.

a. Identify schedule for application of interior finishes.
2. Procedures for moisture control during construction.
a. Identify porous materials and absorptive materials.
b. Identify schedule for inspection of stored and installed absorptive materials.
3. Revise and resubmit Plan as required by Owner.
a. Approval of Contractor's Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations.

B. Product Data:
1. Submit product data for filtration media used during construction and during operation. Include Minimum Efficiency Reporting Value (MERV).
2. Submit air pressure difference maps for each mode of operation of HVAC.
3. Material Safety Data Sheets: Submit MSDSs for inclusion in Operation and Maintenance Manual for the following products. Coordinate with Section 01 78 23.
a. Adhesives.
b. Floor and wall patching/leveling materials.
c. Caulking and sealants.
d. Insulating materials.
e. Fireproofing and firestopping.
f. Paint.
g. Lubricants.
h. Cleaning products.

C. Inspection and Test Reports:
1. Moisture control inspections.
2. Moisture penetration testing.

1.4 PRECONSTRUCTION MEETING

A. After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with Owner and Architect to discuss the proposed IAQ Management Plan and to develop mutual understanding relative to details of environmental protection.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 – EXECUTION

3.1 IAQ MANAGEMENT – EMMISSIONS CONTROL

A. During construction operations, follow the recommendations in SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition, 2007, ANSI/SMACNA 008-2008 (Chapter 3).

B. HVAC Protection:
1. Provide temporary exhaust during construction operations.
2. Do not use new HVAC equipment for construction ventilation without prior approval of Architect.

C. Source Control: Provide low and zero VOC materials as specified.

D. Pathway Interruption: Isolate areas of work as necessary to prevent contamination of clean or occupied spaces. Provide pressure differentials and/or physical barriers to protect clean or occupied spaces.

E. Housekeeping: During construction, maintain project and building products and systems to prevent contamination of building spaces.

F. Temporary Ventilation: Provide an ACH (air changes per hour) of 1.5 or more and as follows:
1. Provide minimum 48-hour pre-ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 degrees F minimum to 90-degree F maximum continuously during the ventilation period. Do not ventilate within limits of Work unless otherwise approved by Architect.
2. Provide adequate ventilation during and after installation of interior wet products and interior final finishes.

3. Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 as determined by ASHRAE 52.2 during construction. Coordinate with work of Division 23, Heating Ventilating and Air Conditioning (HVAC). If permanently installed air handlers are to be used for ventilation (with approval of Architect), such filtration must be provided at each return air opening.

G. Scheduling: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible.

H. Flush-Out: After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.

3.2 IAQ MANAGEMENT – MOISTURE CONTROL

A. Housekeeping:
1. Keep materials dry. Protect stored on-site and installed absorptive materials from moisture damage.
2. Verify that installed materials and products are dry prior to sealing and weatherproofing the building envelope.
3. Install interior absorptive materials only after building envelope is sealed and weatherproofed.

B. Inspections: Document and report results of inspections; state whether of not inspections indicate satisfactory conditions.
1. Examine materials for dampness as they arrive. If acceptable to Architect/Owner, dry damp materials completely prior to installation; otherwise, reject materials that arrive damp.
2. Examine materials for mold as they arrive and reject materials that arrive contaminated with mold.
3. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect weekly:
   a. Where stored on-site or installed absorptive materials become wet, notify Architect. Inspect for damage. If acceptable to Architect/Owner, dry completely prior to closing in assemblies; otherwise, remove and replace with new materials.
4. Basement: Monitor basement and crawlspace humidity, and dehumidify when relative humidity is greater than 85 percent for more than 2 weeks or at the first sign of mold growth.
5. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
6. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
   a. Air barrier: Verify air barrier is installed without punctures and/or other damage. Verify air barrier is sealed completely.
   b. Flashing: Verify correct shingling of the flashing for roof, walls, windows, doors, and other penetrations.
   c. Insulation layer: Verify insulation is installed without voids.
   d. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair.
7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
8. HVAC: Inspect HVAC system as specified in Section 01 91 00 – Commissioning, and the following:
   a. Condensate pans are sloped and plumbed correctly.
   b. Access panels are installed to allow for inspection and cleaning of coils and ductwork downstream of coils.
   c. Ductwork and return plenums are air sealed.
   d. Duct insulation is installed and sealed.

C. Schedule:
1. Schedule work such that absorptive materials, including but not limited to porous insulations, paper-faced gypsum board, ceiling tile, and finish flooring, are not installed until they can be protected from rain and construction-related water.
2. Weather-proof as quickly as possible. Schedule installation of moisture-control materials, including but not limited to air barriers, flashing, exterior sealants and roofing, at the earliest possible time.

D. Testing for Moisture Penetration:
1. Horizontal Waterproofing (not roofing): Test as per ASTM D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations; acceptable upper limits are no leakage for 15 minutes.
2. Exterior Walls:

a. Water Leakage: Review as per ASTM E2128 Standard Guide for Evaluating Water Leakage of Building Walls.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

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 ¾" 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 and City of Madison logo.
   2. Names and title of Architect.
   3. Name of major subcontractors.
   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

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide general guidelines and responsibilities related to the receiving, handling, and storage of all materials and products from arrival on the job site through installation.
   1. Immediate inspection of delivered goods means a timely replacement if damaged.
   2. Proper storage helps prevent damage and loss by weather, vandalism, theft, and job site accidents.
   3. Proper storage helps with job site performance and safety.
   2. Proper handling helps prevent damage and job site accidents.

B. Each Contractor shall be directly responsible for the receiving, handling, and storage of all materials and products associated with the Work of their Division or Trade.

C. Each Contractor responsible for Work associated with Owner provided materials or products shall be responsible for the receiving, handling and storage of the material/product as outlined in Section 3.8 below..

1.2. RELATED SPECIFICATIONS

A. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public Works Construction".
   1. Use the following link to access the Standard 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 Standard Specification **2**10.2" 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.
      c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.

B. Section 01 57 21 Indoor Air Quality

C. Section 01 74 13 Progress Cleaning

D. Section 01 76 00 Protecting Installed Construction

E. Other Divisions and Specifications that may address more specifically the requirements for the storage and handling of materials and products associated Work of other Divisions or Trades.

1.3. QUALITY ASSURANCE

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

b. Immediately report any damaged products or equipment to the GC, begin arrangements for immediate replacement.
c. Materials or equipment that have been damaged, are incomplete, or do not comply with the construction documents shall not be permitted to be installed.

2. All materials and products shall be stored within the designated limits of the project site. Only store the amount of material necessary for upcoming operations so as not to interfere with other construction activities and access to Work by the Owner and Architect. Any offsite storage shall be at the expense of the contractor storing the material or product. All offsite storage requirements shall comply with this specification. All offsite storage of materials is subject to Owner Representative Quality Management review at any time.
3. Large storage containers may be used but shall be weather tight, securable, placed on concrete blocks, timbers, or jack stands and shall be level.
4. When lifting equipment is required the equipment rating shall be greater than the loading requirements of the item being lifted. In addition all of the following shall apply as necessary:
   a. Only designated and/or designed lift points shall be used.
   b. Large items shall have tag lines and handlers at all times during lifting operations.
   c. Lift at multiple points as needed to prevent bending.
5. Materials and products stored inside of the structure shall comply with all of the following:
   a. Storage shall not be allowed to impede the flow of work in progress.
   b. Storage shall not be allowed to hide completed work from review and inspections.
   c. Storage shall not exceed the design loads of the structural components it is being stored upon.
6. All materials and products shall be stored according the manufacturers minimum recommended requirements. All of the following shall be considered before storing any product or material:
   a. Dust and dirt
   b. Moisture and humidity, including rain and snow
   c. Excessive temperatures, direct sun, etc
   d. Product or material weight and size
   e. Potential for breakage
   f. Product incompatibility with other products such as corrosiveness, chemical reactions, flammability, etc.
   g. Product or material value and replacement cost
7. The Contractor shall be responsible for providing fully functional tarps or plastic wrap, to protect materials and products from the weather. All coverings shall be free of large holes and tears, and shall be tied, strapped, or weighted down to resist blowing.
8. The Contractor shall be responsible for any temporary heating, cooling, or other utility requirement that may be associated with the storage of a material or product.
9. The Contractor shall be responsible for securing materials and products of value such as copper, A/V equipment, etc. Such items shall be stored in securable shipping containers, job trailers or other such storage devices. Container shall be kept secured when not in use.

B. The GC shall inspect the job site daily to ensure that all products and materials stay weather tight and are secured against vandalism or theft as required by this specification.
C. The Owners Representative may at any time request improvements regarding storage of any material or product being provided under these construction documents.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. GENERAL CONTRACTOR REQUIREMENTS

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

1. When openings are required in completed Work (new or existing) the GC shall be responsible for providing an appropriate opening and for restoring the opening to the original or better condition upon completion. Restoration shall be weather tight and complete.

C. Repeated moving and handling of items being stored shall not be allowed. The GC shall be responsible for any damage and replacement because of mishandling or excessive handling.

3.2. BULK MATERIAL

A. Bulk material such as sand, gravel, top soil and other types of fill shall be stored away from the construction area and shall be stock piled as follows:
1. All bulk material shall be piled safely and efficiently in as small an area as practical. Only store the amount of material necessary for upcoming operations so as not to interfere with other construction activities and access to Work by the Owner and Architect.
2. All stock piles shall have silt fence/sock properly installed around the perimeter to prevent erosion and loss of material. Refer to City of Madison Standard Specification Section 210.1(f) and other related specification or details.
3. Fine grained material shall be protected with tarps to prevent blowing. Tarps shall be weighted or staked to stay in place.

B. Bulk material such as brick, concrete block, stone, and other palletized materials shall be stored on original shipping pallets until ready for use.

3.3. DRY PACKAGED MATERIAL

A. Dry packaged material such as cement, mortar, etc shall be stored on pallets, on slightly elevated ground or clear stone pad to keep water away from the base of the material being stored. Protect from moisture.

3.4. STRUCTURAL AND FRAMING MATERIAL

A. All structural and framing material shall be stored in an organized manner arranged by type, size and dimension. Materials shall be stored on pallets or timbers as necessary and shall not be allowed to lie directly on the ground.

B. Long and heavy items shall be supported at several points to prevent bending and warping.

3.5. EQUIPMENT

A. Equipment delivered to the site shall be stored away from all construction activities until the item can either be moved inside or properly installed.

B. Equipment shall be stored on slightly elevated ground or clear stone pad to keep water away from the base of the equipment.

3.6. FINISH PRODUCTS

A. Finish products such as flooring, tile, counters, lockers, toilets, partitions, lighting, and other similar items should not be delivered and stored until the structure has been enclosed, is weather tight, temperature controlled and the contractor is ready for such items to be installed.
1. Storage of finished products outside for any length of time shall not be allowed.

B. Products that cannot be stored inside the structure shall be stored in secured containers or job trailers until such time as they are ready to be installed.

C. Products with a high potential for breakage such as glass, mirrors, tiles, toilet fixtures, etc. shall be stored with additional protection as necessary such as but not limited to the following:
1. Store in original shipping containers until ready for installation.
2. Do not store in high traffic areas.
3. Shield with other materials such as cardboard, plywood, or similar products.

3.7. DUCTWORK, PIPING, AND CONDUIT

A. All piping and conduit shall be stored horizontally unless otherwise specified by the manufacturer or Division and Trade Specifications.
1. Do not store directly on grade.
2. Cover metal pipes and tubes to prevent rust and corrosion, allow ventilation to prevent condensation.
3. Whenever possible use pipe stands for storing pipe and conduit to prevent tripping and rolling hazards.

B. All ductwork shall be stored horizontally or vertically as necessary unless otherwise specified by the manufacturer or Division and Trade Specifications.
1. During storage, both ends of each duct shall be protected with plastic sheathing to prevent dust and dirt 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

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 00
EXECUTION

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.

B. Related Requirements:
   1. Section 01 10 00 "Summary" for limits on use of Project site.
   2. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by professional engineer licensed in the State of Wisconsin certifying that location and elevation of improvements comply with requirements.

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

1.3 QUALITY ASSURANCE

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

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

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

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

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

B. General: Engage a professional engineer licensed in the State of Wisconsin to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Inform installers of lines and levels to which they must comply.
   5. Check the location, level and plumb, of every major element as the Work progresses.
   6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
   7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

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

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

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

3.4 FIELD ENGINEERING

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

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

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

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

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

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

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

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
    1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
    2. Allow for building movement, including thermal expansion and contraction.
    3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
J. Remove and replace damaged, defective, or non-conforming Work.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
    1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
    2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
    3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
        a. Use containers intended for holding waste materials of type to be stored.
    4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
B. Site: Maintain Project site free of waste materials and debris.
C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
    1. Remove liquid spills promptly.
    2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls" and Section 01 74 19 "Construction Waste Management and Disposal."
H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.7 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 00 " Commissioning."
B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
C. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

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SECTION 01 73 29
CUTTING AND PATCHING

PART 1 – GENERAL

1.1. SUMMARY

A. This Section includes general procedural requirements for cutting and patching including, but not limited to the following:
   1. Examination
   2. Preparation
   3. Performance
   4. Cleanup and Restoration

1.2. RELATED SPECIFICATION SECTIONS

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

1.3. DEFINITIONS

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

1.4. QUALITY ASSURANCE

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

1.5. WARRANTY

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

B. All cutting and patching work performed under this contract shall be warranted like new work as defined by the Specification governing the work.

PART 2 - MATERIALS

2.1. GENERAL

A. Comply with requirements specified within other sections of the Specifications.

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

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

PART 3 - EXECUTION

3.1. EXAMINATION

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

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

3.2. PREPARATION

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

B. Protection: Protect in-place construction and existing conditions during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations. If the failure to protect, or the lack of protection, of in-place construction and/or existing conditions results in damage, the contractor shall be responsible for repair to previous condition.

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

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

3.3. PERFORMANCE

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

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

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

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

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

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

3.4. CLEANUP AND RESTORATION

A. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

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

END OF SECTION

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SECTION 01 74 13
PROGRESS CLEANING

PART 1 – GENERAL

1.1. SUMMARY

A. Throughout the execution of this contract all contractors shall be responsible for maintaining the project site in a standard of cleanliness as described in this specification.

B. All contractors shall also comply with the requirements for cleaning as described in other specifications.

C. Work included in this specification shall include but not be limited to:

1. Safety Cleaning
2. Project Site Cleaning
3. Progress Cleaning
4. Final Cleaning

1.2. RELATED SPECIFICAITONS

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

1.3. QUALITY ASSURANCE

A. The General Contractor (GC) shall conduct daily inspections, more often if necessary, of the entire project site to ensure the requirements of cleanliness are being met as described within these specifications.

B. All contractors shall comply with other regulatory requirements as they apply to waste recycling, reuse, hauling, and disposal requirements of any governmental authority having jurisdiction.

C. The Owner reserves the right to have work done by others in the event any contractor fails to perform cleaning as described within these specifications. The cost of any Owner provided cleaning shall be charged to the contractor through a deduct change order.

PART 2 - PRODUCTS

2.1. CLEANING MATERIALS AND EQUIPMENT

A. The Contractor shall provide all required personnel, equipment, and materials necessary to maintain the required level of cleanliness as described in this specification.

B. Use only cleaning materials and equipment that are compatible with the surface being cleaned, as recommended by the manufacturer, or as approved by the A/E.

C. Use only cleaning materials, equipment, and methods as recommended in the manufacturers care and use guide of the material, finish or equipment being cleaned.

PART 3 - EXECUTION

3.1. SAFETY CLEANING

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

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

3.2. PROJECT SITE CLEANING

A. This section applies to the general cleanliness of the project site as a whole for the duration of the execution of this contract.

B. Exterior Project Site Areas
   1. The GC and other Contractors as appropriate shall ensure the following levels of cleanliness are applied to the exterior project site areas.
      a. The overall appearance of the project site is neat and orderly. Defined areas for material storage, material waste, job trailers, and the project area are clean and well maintained.
      b. The construction fence is maintained, erect with no gaps, and properly posted per all regulatory requirements.
      c. All erosion control measures are properly maintained, cleaned, and repaired as necessary.
      d. All loose materials (construction or waste) are properly tied or weighted down to resist blowing.
      e. All construction materials are properly covered with fully functional tarps or plastic wrap, protected from the weather, coverings are tied, strapped, or weighted down to resist blowing.
      f. Dust control is applied as necessary or as required by any regulatory requirement.

C. Interior Project Site Areas
   1. All Contractors shall ensure the following levels of cleanliness are applied to the interior project site areas.
      a. The overall appearance of the project site is neat and orderly. Defined areas for material storage, material waste, and project area are clean and well maintained.
      b. Stored materials are kept in original shipping containers whenever possible. Stored materials not in shipping containers are properly stored and protected according to other applicable specifications.
      c. All scraps and debris shall be properly disposed of as often as necessary to keep work areas, passageways, stairs, and ramps free of debris and clear for emergency exiting.
      d. Boxes, pallets, and other such shipping containers, are broken down, stored in a consolidated area or, disposed of as often as is necessary.
      e. Hand tools, supplies, materials, electrical cords not being used are picked up and sptored in gang boxes, not left as walking hazards in work areas, passageways, etc.

D. Job Trailer
   1. The interior of the job trailer shall be kept clean and available as a work space at all times. The GC shall ensure that the following is provided for within the job trailer:
      a. Meeting space including tables and chairs.
      b. Sufficient space for all contractors to access the official construction documents, provide updates, etc.

3.3. PROGRESS CLEANING

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

c. Large items shall be properly stored, returned to designated areas, or disposed of as necessary.
d. Loose materials shall be properly secured.
e. Flammable or hazardous materials are properly stored or disposed of.

3. Weekly cleaning shall be conducted by all contractors as designated by the GC. Weekly cleanings shall include all the above for a daily cleaning and other necessary cleaning as designated by the GC.

B. This sub-section shall apply to Progress Cleaning in preparation for the installation of finishes, fixtures, and trim.
a. Surfaces receiving finishes shall be thoroughly cleaned prior to contractors applying finish materials. The GC shall be responsible for inspecting the area and surfaces being cleaned for finish prior to the sub-contractor applying the finish. This shall include but not be limited to the following:
i. Wall surfaces shall be wiped clean of dirt and oily residues, vacuumed free of dust, and shall be free of surface imperfections prior to painting or installing wall coverings.
ii. Metal surfaces shall be wiped clean of dirt and oily residues, and be free of surface imperfections prior to painting.
iii. Flooring shall be broom swept of large and loose items then vacuumed clean of dust and small particles, and damp mopped clean and dried prior to installing any flooring finish. Additional cleaning may be required depending on the preparation requirements recommended by the flooring material manufacturer.

C. This sub-section shall apply to Progress Cleaning after the installation of finishes, fixtures, and trim.
1. For the purposes of this section "clean" shall be defined as a level of cleanliness free of dust and other material capable of damaging or visually disfiguring finished work, finishes, fixtures, and trim.
2. Progress Cleaning at this point in the contract shall be conducted immediately as follows:
a. Dust, dirt, etc shall be swept and vacuumed off of finish flooring and trim.
b. Liquid spills shall be cleaned up according to the spill type. This shall include drips and spills caused by paint, stain, sealants, and other such items.
3. The Contractor(s) at no additional cost to the Owner shall be responsible for replacing any finished work, finishes, fixtures, and trim damaged or disfigured because of inadequate or improper cleaning.

3.4. FINAL CLEANING

A. As noted in Specification 01 29 76 Progress Payment Procedures, Progress Payment Milestone Schedule, Final Cleaning shall not be conducted prior to requesting the 90% contract total progress payment and all of the following shall be complete:
1. All final regulatory inspections including but not limited to Building Inspection Department and Madison Fire Department inspections have been successfully completed.
2. All Quality Management Observation (QMO) reports have been closed out.
3. All Demonstration and Training has been completed.
4. All Attic Stock has been consolidated and located to its designated area
5. All protection for installed construction shall be removed prior to final cleaning by the contractor responsible for providing the protections. This shall include the removal of any adhesive residues left behind from tapes. Contractors shall only use manufacturer authorized cleaning materials for removing adhesives, etc.

B. For the purposes of this section "clean" shall be defined as a level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

C. The GC shall be responsible for ensuring that all requirements under this section are being met.

D. General Requirements
1. Employ experienced personnel or professional cleaners for final cleaning as necessary for the areas or equipment being cleaned.
2. Cleaning equipment used shall be commercial grade equipment commonly used by professional cleaners.
3. Cleaning equipment and materials shall be cleaned, rinsed, or replaced to ensure a uniform level of cleanliness is being maintained during the final cleaning. This shall include but not be limited to the following:
a. Vacuum cleaner bags and/or filters are changed and/or cleaned as often as necessary.
b. Dust & wipe down rags are washed, rinsed, or replaced before starting each room.
c. Mopping equipment
i. Mop water for washing shall have cleaning solution added to the amount and temperature per manufacturer's recommendations. Mop washing water shall be replaced often to maintain the levels of the cleaning solution and temperature required.
ii. Mop water for rinsing shall remain clean, clear, and be replaced as often as necessary.

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

PART 1 – GENERAL

1.1. SUMMARY

A. This specification includes administrative and procedural requirements for the recycling, re-use, salvaging, and disposal of non-hazardous construction and demolition waste.

B. The General Contractor (GC) shall be fully responsible for complying with all applicable ordinances and other such regulatory requirements during the execution of this contract.

1.2. RELATED SPECIFICAITONS

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

1.3. CITY ORDINANCES

A. There are two (2) Madison General Ordinances (MGO) that the City of Madison has regarding construction and demolition waste.
   1. MGO 10.185, Recycling and Reuse of Construction and Demolition Debris, describes the requirements associated with this ordinance including definitions, documentation requirements, and penalties.
   2. MGO 28.185, Approval of Demolition (Razing, Wrecking) and Removal, describes the requirements associated with applying for and receiving a demolition permit.

B. All City of Madison, Board of Public Works, contracts being conducted by City Engineering, Facility Management, for construction, remodeling, or demolition shall comply with the above ordinances regardless of project type or size.

1.4. DEFINITIONS

A. Clean: Untreated and unpainted material, free of contamination caused by oils, solvents, caulks, and other chemicals.

B. Construction and Demolition Debris: Materials resulting from the construction, remodeling, repair, and demolition of utilities, structures, buildings, and roads.

C. Disposal: Off-site removal of construction and demolition debris and the subsequent sale, recycling, reuse, or deposit in authorized landfill or incinerator.

D. Hazardous: Exhibiting the characteristics of hazardous substance, i.e. ignitability, corrosiveness, toxicity, or reactivity and including but not limited to asbestos containing materials, lead, mercury and PCBs.

E. Non-hazardous: Exhibiting none of the characteristics of a hazardous substance.

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

1.5. PERFORMANCE REQUIREMENTS

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

1.6. SUBMITTALS AND DELIVERABLES

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

2. Records of Sales: Indicate receipt and acceptance of itemized salvageable waste sold to individuals or organizations. Indicate if the organization is tax exempt.
3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.
5. Statement of Refrigerant Recovery: The Refrigerant Recovery Technician responsible for recovering refrigerant shall provide the GC with a statement indicating all of the following:
    a. All recovery was performed according to EPA Regulations.
    b. All refrigerant present was recovered; indicate the total quantity recovered by unit.
    c. Date of Recovery.
    d. Name, address, company name, and phone number of technician performing the recovery.
    e. Technician shall sign and date the statement.

C. LEED Submittal: The GC shall provide the following information using the appropriate LEED letter template upon project completion: indicating that the requirements of the credit have been met. *NOTE: This requirement shall only apply to projects having a LEED certification goal.*
1. Total waste material generated.
2. Total waste material diverted by diversion method; recycling, salvage, re-use, etc.
3. Statement that the credit requirements have been met.
4. GC shall sign the letter.

1.7. QUALITY ASSURANCE

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

D. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.8. WASTE MANAGEMENT PLAN

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

iii. Designated locations on the project site for waste material containers.

B. If project requires demolition incorporate the ordinance required (MGO 28.185) Recycling and Reuse Plan into the Waste Management Plan.

C. Provide all of the following for the Waste Management Coordinator:

1. Name, employer, employer address, phone number, and email address of the designated coordinator.
   a. The GC shall also provide this information with the required Project Directory Submittal at the beginning of the project.

D. If at the option of the GC, he/she chooses to contract with a Waste Management Disposal Company that allows comingled and unsorted waste materials, the GC shall include with his/her Waste Management Plan the following:

1. Name, address, phone number, state permitting information, and other pertinent information about the disposal company.
2. Documentation from the disposal company indicating company policies and procedures regarding comingled and unsorted waste materials to include:
   a. GC responsibilities on the project site.
   b. Disposal company procedures for receiving, sorting, recycling, and disposing of comingled and unsorted waste material.

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. PLAN IMPLEMENTATION

A. Implement the approved waste management plan. Provide adequate containers, storage space, signage, transportation and other items required to implement the plan during the execution of this contract.

B. The GC and Waste Management Coordinator shall be responsible for monitoring and reporting the status of the Waste Management Plan and shall monitor the waste management practices on site as frequently as needed.

C. Train all workers, sub-contractors, and suppliers on proper waste management procedures as appropriate for the work being conducted on the project site.

1. Distribute the waste management plan to everyone concerned within seven (7) days of submittal approval.
2. Distribute the waste management plan to new workers, sub-contractors, and suppliers when they first appear on the project site.
3. Conduct additional training as needed during the execution of the contract to keep a positive focus on the waste management plan.

D. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent and used facilities.

1. Designate and label specific areas on the project site necessary for separating materials to be salvaged, recycled, reused, donated, and sold.
2. Comply with any specification or regulatory requirements pertaining to dust, dirt, environmental protection, and noise control.

3.2. HAZARDOUS AND TOXIC WASTE

A. The Owner shall be responsible under separate contract for the removal of any asbestos related materials. All other materials shall be removed by the GC.

B. All hazardous and toxic waste shall be separated, stored, and disposed of according to all applicable regulations.

C. All hazardous and toxic materials on site shall have a Material Safety and Data Sheet (MSDS) available that indicates storage requirements, emergency information, and disposal requirements as necessary.

3.3. GENERAL GUIDELINES FOR ALL WASTES

A. Recycle all paper and beverage containers used by workers, sub-contractors, suppliers and visitors to the project site.

B. All revenues, savings, rebates, tax credits, and other such incentives received from recycling, reusing, or salvaging waste materials shall accrue to the GC unless specified otherwise in the contract documents.

C. Separate recyclable, reusable, and salvageable waste from other waste materials, trash, and debris except where Waste Management Disposal Company allows comingled waste materials, see section 1.8.D above.

1. Separate by type in appropriate containers or designated areas according to the approved waste management plan away from the construction area. Do not store within the drip lines of existing trees.

2. Inspect containers and bins frequently for contamination and inappropriately sorted materials. Remove contaminated materials and resort as necessary.
3. Stockpile bulk materials such as sand, topsoil, stone, etc., on site away from the construction area and without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water, and cover to prevent windblown dust. Do not store within the drip lines of existing trees.
4. Whenever possible store items off the ground and/or protect them from the weather.

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

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

N. Piping and conduit: Reduce all piping and conduit to straight lengths, sort and store by size, material and type. Remove supports, hangers, valves, boxes, sprinkler heads, and other such components, sort and store by size, material and type. Transport to authorized recycling facilities according to material types.

O. Roofing: Roofing materials shall be sorted and containerized by type, transport to authorized recycling facilities according to material types.

P. Site-Clearing Waste: Sort all site waste by type.

1. Only stockpile soils types and quantities required for re-use on the project site. All remaining quantities shall be transported off site to an authorized facility that receives such materials.
2. Brush, branches, and trees with no marketable re-use shall be transported to facilities for chipping into mulch.
3. Trees with a marketable re-use shall be salvaged and transported to facilities that specialize in processing trees for future use as wood products.

3.5. GUIDELINES FOR DISPOSAL OF WASTES

A. The following guidelines shall be adjusted as needed by the methods and procedures identified in the Waste Management Plan.

B. Any waste that is contaminated, organic, or cannot be recycled, re-used, or salvaged shall be legally disposed of in an authorized landfill or incinerator. Disposal methods shall follow all applicable regulatory requirements.

C. No waste material of any kind, except those types designated as clean fill in section 3.4 above, shall be allowed to be buried on the project site at any time.

D. No burning of any kind of waste material shall be permitted on this project site at any time.

E. Paint and Stain: Paints, stains, and their containers shall be disposed of as follows:

1. Whenever possible containers should be thoroughly cleaned immediately after emptying and sorted with as appropriate (metal or plastic) for recycling
2. Empty containers, regardless of type or base material, may be disposed of with lids off with general garbage.
3. Latex paint may be placed with general garbage if properly solidified as follows:
   a. Small amounts (an inch or less in can): Remove lids and allow paint to dry out in the can and harden. Protect cans from rain and freezing.
   b. Large amounts (more than one inch): Mix paint with equal amounts of cat litter, stir and allow to completely dry. Alternate method: mix with commercial paint hardener.
4. Oil-based or combustible paints and stains, regardless of liquid or solid, shall be transported to an approved facility that takes such items such as Dane County Clean Sweep Sites.

F. Treated Wood Materials: Treated wood materials including but not limited to wood that has been painted, stained, or chemically treated shall not be recycled or incinerated.

END OF SECTION

SECTION 01 76 00
PROTECTING INSTALLED CONSTRUCTION

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide clear responsibilities, guide lines, and requirements related to providing protection to already installed construction.

B. Already installed construction shall include but not be limited to the following:

1. Any existing site feature such as pavement, curbs, drainage features, utilities, landscaping features (trees, shrubbery, plantings, flagpoles, etc) and other such exterior items not associated with the building whether on or adjacent to the project site.
2. Any existing structure on or adjacent to the project site.
3. Any existing interior work that may be adjacent to the new work including all paths of ingress/egress to areas associated with accessing the Work.
4. Any existing feature of any kind within the public right-of-way that may be on the project site property, adjacent to the project site or across the street from the project site.

C. All contractors shall be familiar with the specifications of their Division of Work for specific requirements on protection of the Work.

D. The requirements noted within this specification do not relieve any contractor of the responsibility for compliance with any code, statute, ordinance, or other such regulatory requirement having jurisdictional authority over these contract documents.

1.2. QUALITY ASSURANCE

A. It shall be the responsibility of every contractor and worker assigned to the project to be diligent in protecting all existing work, and newly installed construction.

B. It shall be the General Contractors' (GC) responsibility under the contract to provide all reasonable protection methods, materials, or precautionary measures required to protect new or existing construction as described in within this specification to the project as a whole.

1. The GC shall be responsible to ensure any damaged new or existing construction is repaired or replaced at no additional cost to the Contract.
2. The GC at his/her discretion may direct other contractors to provide and maintain protection of completed work associated with their Division of Work. I.E.: The carpet installer may be required by the GC to provide carpet protection along traveled paths, ingress/egress, etc after installation.

C. It shall be the responsibility of the GC to ensure that all materials being used to protect installed construction are compatible with, and/or adjacent to, the materials being protected. This shall include but not be limited to the material used as covering, tapes used to fasten protective materials, etc.

1.3. RELATED SPECIFICATIONS

A. Parts of this specification will reference articles within "The City of Madison Standard Specifications for Public Works Construction".

1. Use the following link to access the Standard 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 Standard Specification **2**10.2" 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.
   c. City Standard Detail Drawings (SDD) may be located from the index in Part VIII.

B. Section 01 60 00 Product Requirements

C. Section 01 74 13 Progress Cleaning

PART 2 - PRODUCTS

2.1. FENCING MATERIALS AND BARRICADES

A. Except where noted in other areas of the construction documents, the responsible contractor shall provide a six foot galvanized chain link fence including full height mesh screen at the project lines as shown on the Civil Drawings. For temporary barricade situations, the responsible contractor may provide one of the following that sufficiently provide a sturdy physical barrier and/or visual barrier as necessary for the intended application.

1. Standard orange construction barrels each with a standard rubber base ring and reflective tape
   a. Provide flashing amber lights as needed to increase night time visibility
2. Steel "T" style fence posts
3. 4'0" high standard orange construction fence
4. Traffic barricades
5. Jersey barriers
6. Other types of fencing or barricades typically used in the construction industry

B. The contractor responsible for providing the fencing materials and barricades shall also be responsible for maintaining them. This shall include but not limited to fixing damaged fencing, standing up barrels that have been knocked over, realigning barrels, and ensuring flashing lights are fully operational at all times.

C. The following fencing and barricade designations, and their use descriptions shall be used throughout this specification to provide uniformity in describing protection requirements.

1. Type A, Jersey Barriers, to be used as permanent blocking devices to deny access to alternate project site entrances or exits.
2. Type B, Traffic Barricades, to be used as temporary blocking devices to deny access to alternate project site entrances or exits.
3. Type C, Construction Barrels without construction fencing shall be used for lane closures, temporary blocking devices to deny access and the protection of single locations (I.E. identify the location of an access structure) that do not require fencing.
4. Type D, Construction Barrels with construction fencing where it becomes necessary to surround an object with a complete visual barricade and it is impractical or unacceptable to install fence posts. The surround shall be constructed in such a manner as to provide a buffer zone around and access to the item being protected.
5. Type E, Steel "T" Fence Posts shall be used at the project lines, as indicated on the Civil Drawings, with six foot galvanized chain link fencing to surround an object with a complete visual barricade and it is practical to install fence posts. The surround shall be constructed in such a manner as to provide a buffer zone around and access to the item being protected. All posts shall be driven installed. Surface mounted posts to only be used for temporary barricades.
6. Type X, Other fencing or barricade types that may be designated and detailed within the construction documents shall use additional alpha numeric designations.

2.2. EROSION CONTROL PROTECTION

A. Refer to City of Madison Standard Specification 210.2 for authorized materials associated with erosion control materials.

2.3. INTERIOR FINISH PROTECTION MATERIALS

A. Except where noted in other areas of the construction documents or this specification the responsible contractor:
   1. Shall not provide the cheapest or least effective method as an effort to meet any protection requirement.
   2. Shall provide materials of sufficient quality, and durability to provide adequate protection based on the seasonal conditions and the anticipated duration at the time the protection will be needed.
   3. Shall provide sufficient quantity of protection material to protect the construction as needed.

B. Prior to installing protective measures the responsible contractor shall propose to the GC, Project Architect (PA) and City Project Manager (CPM) the proposed plan for protection, materials to be used and samples as necessary.
   1. The PA and CPM reserve the right to disapprove any proposed method and/or material and/or make alternate proposals.

PART 3 - EXECUTION

3.1. GENERAL EXECUTION REQUIREMENTS

A. The GC shall be responsible for ensuring all of the following procedures and requirements are implemented as needed for the duration of the Work performed under this contract.

B. The GC shall also be responsible for the following:
   1. Reporting any incident of damage to existing property, right-of-way, or utility to the CPM immediately upon rendering the incident safe, and notifying emergency response teams, and emergency utility crews as needed.
   2. Conduct a site walk through prior to leaving at the end of each day to assess:
      a. Protection measures are properly in place, provide correction actions as necessary.
      b. Note damage to existing completed work and schedule repair/replacement as needed.
   3. Ensure all contractors and workers are being diligent in protecting existing work, and newly installed construction.

3.2. PROTECT ADJACENT PROPERTIES

A. Whenever possible through the design process the City of Madison shall have previously provided notice to adjacent property owners that work will be occurring on or near their property. The City of Madison shall also have obtained any permanent or temporary easements that may be necessary to complete any Work on adjacent properties.

B. It shall be the responsibility of the GC to do the following for all Work under this contract being performed on or adjacent to the property line:
   1. Contact the adjacent property owner and provide him/her with information on the work to be done, equipment to be used, and estimated duration of the work. Information to be updated and communicated to property owner(s) as construction progresses and site conditions change.
      a. If any adjacent property is a rented or leased space the GC shall also make contact and provide the same information to the tenants.
      b. Determine from the owner and/or tenants if there are any concerns for children, pets, special plantings, or other concerns.
   2. Discuss the following with all contractors performing work on or near the property line.
      a. Work to be completed and timeline.
      b. Concerns of adjacent property owners/tenants from item 1 above.
      c. Which protective measures will be necessary to protect adjacent properties and address the concerns of adjacent property owners/tenants.
   3. Ensure all protective measures are placed and maintained during the execution of Work on or adjacent to the property line. Interact with the adjacent property owners/tenants as needed.

C. Any contractor doing work on or adjacent to the property line shall install and maintain any protective measure identified in the contract documents, this specification, or as directed by the GC.

D. The GC shall be responsible for restoring any damage to structure and property located on or adjacent to the property line.
   1. Restoration shall include but not be limited to repair or replacement using like materials and finishes to its original condition or better.
   2. Restoration of landscaping materials shall include watering of any seed, sod, or other planting of any kind for a reasonable period of time to encourage germination and root development.

E. The GC shall keep the CPM informed directly to any issues pertaining to adjacent property owners and tenants.

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 Standard 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 Standard 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 Standard 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 Standard 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 Standard 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.
   a. Protection at traffic signage/signals shall not obstruct the viewing of the sign/signal for its intended purpose at any time.

B. When additional protection for traffic control is required, the use of barricades, guardrails, lane closures and other such procedures will be detailed within the construction documents.

C. When additional protection for overhead sidewalk cover is required the contract documents shall indicate the specific location and structural requirements of the protective structure.

3.6. PROTECT STORED MATERIALS

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

3.7. PROTECT WORK - EXTERIOR

A. Provide all temporary services that may be required to protect the installed material from heat, cold, humidity, etc, while materials such as concrete, mortar, sealants, paints, etc, are drying and/or curing.

B. Open trenches, pits, and other such excavations shall be properly covered, lined, or shored as needed during periods of inclement weather to prevent the caving of soils onto existing work in progress. Refer to the appropriate specifications and/or regulatory requirements governing this type of work as necessary.

C. Provide adequate protection at all openings with heavy duty tarps, plastic sheathing, or wood framing and sheathing as needed to protect interior work in progress from inclement weather as needed.

D. Protect exterior finishes of all kinds with heavy duty tarps or plastic sheathing as needed while landscaping is being installed through full germination of seeded areas or installation of filter fabric and mulches to keep dust, dirt, and mud off of finished exterior surfaces.

E. Designate specific curb mounting points and provide wood blocking where small vehicles, skid loaders and other such equipment may need access to areas being landscaped.

F. Provide plywood turning pads for skid loaders to turn on to prevent tire marking on new pavement.

G. Do not permit the parking of vehicles with any kind of fluid leaks to park on new pavement.

H. The contractor shall be responsible for cleaning, repairing, or replacing any completed work or work in progress under this specification as deemed necessary by the CPM without additional cost to the contract.

3.8. PROTECT WORK - INTERIOR

A. The GC shall do all of the following:

1. Provide all temporary services that may be required to protect the installed material from heat, cold, humidity, etc, while materials such as concrete, mortar, sealants, paints, etc, are drying and/or curing.
2. Provide adequate visual and/or physical protection as needed to protect newly completed interior work such as paint, flooring material, sealants, grouts, etc that may be drying and/or curing.
3. Provide adequate space and materials for cleaning boots, tool boxes, supplies, and other items coming into the project site once finish work has begun.
4. Clean dirtied areas and repair/replace damaged areas immediately.

B. The contractors responsible for interior work shall be responsible for protecting their work and finishes from dirt, mud, snow, spills, splatters, and physical damage after installation as follows:

1. Protect vinyl composite, rubber composite, painted/stained concrete, and tiled flooring as follows:
   a. Define foot traffic areas and protect with Ramboard Temporary Floor Protection products as a minimum basis of design or other protection product(s) compatible with installed flooring product if Ramboard is not compatible. Products to be used shall be new.
      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 material as necessary.
2. Protect carpeted areas as follows:
   a. Define foot traffic areas and protect with a minimum of 6mil, clear, polyethylene sheeting 3 feet wide. Products to be used shall be new.
      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 all finished walls in high traffic areas with Ramboard Temporary Wall protection products or approved equal.
      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, 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

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to clearly define and quantify the requirements associated with closing a City of Madison Public Works Contract for facility related work.

B. All contracts have two distinct but related paths. Each path needs to be properly closed independently in order to close the contract as a whole.

1. Construction closeout is related to closing out all of the Work associated with the construction documents.
   a. It shall be the responsibility of all contractors to be fully aware of the required Work and closeout requirements involved in their individual trades.
2. Contract closeout is related to closing out all of the administrative aspects of the contract in general.
   a. It shall be the responsibility of all contractors to be fully aware of the administrative requirements required by the contract and to provide the supporting documentation required.
3. Construction Closeout must be completed before Contract Closeout can begin.

C. This specification will provide general knowledge associated with the following areas:

1. Construction Closeout Requirements
2. Construction Closeout Procedure
3. Contract Closeout Requirements
4. Contract Closeout Procedure
5. Final Payment and Certificate of Completion

1.2. RELATED SPECIFICATIONS

A. Contractors shall review all references to other specifications including specifications relating to the execution of the Work associated with their Division or Trade.

B.	Section 01 29 76	Progress Payment Procedures
C.	Section 01 31 23	Project Management Web Site
D.	Section 01 32 26	Construction Progress Reporting
E.	Section 01 45 16	Field Quality Control Procedures
F.	Section 01 74 13	Progress Cleaning
G.	Section 01 45 16	Construction Waste Management and Disposal
H.	Section 01 76 00	Protecting Installed Construction
I.	Section 01 78 13	Completion and Correction List
J	Section 01 78 23	Operation and Maintenance Data
K.	Section 01 78 36	Warranties
L.	Section 01 78 39	As-Built Drawings
M.	Section 01 78 43	Spare Parts and Extra Materials
N.	Section 01 79 00	Demonstration and Training
O	Section 01 91 00	Commissioning

P. Other requirements as noted in the contract documents signed by the General Contractor

1.3. DEFINITIONS

A. ***Substantial Compliance***: A letter provided to the City of Madison Building Inspection and signed by the Project Architect indicating that all Work has been completed to a level that would allow Owner Occupancy and that all construction is in compliance with the construction documents. A copy of this letter is also provided to the State of Wisconsin Department of Health and Safety as necessary to clear plan review requirements. This letter does not represent construction closeout.

B. ***Certificate of Occupancy***: The Regulatory letter from the City of Madison Building Inspection Department indicating that all regulatory requirements and inspections have been completed and the building may now be occupied for its intended use. This letter does not represent construction closeout.

C. ***Certificate of Substantial Completion***: A letter provided by the Department of Public Works, signed by the City Engineer indicating that Construction activities are substantially complete. This letter does represent construction closeout and the date of this letter begins the date of the Warranty Period.

D. ***Construction Closeout***: The point in the contract where all contractual requirements associated the execution of the Work as described in the plans, specifications, and other documents have been successfully met and the items described in 1.3.A, .B, and .C above have been completed.

E. ***Final Progress Payment***: The progress payment associated with achieving Construction closeout as described in 1.3.D above. At this point the contractor may request all monies associated with the contract be paid with the exception of held retainage.

F. ***Contract Closeout***: The point in the contract where all contractual requirements associated with the City of Madison, Board of Public Works contract has been successfully met.

G. ***Final Payment***: The final contract payment submittal that may be approved by the City of Madison after all contractual requirements of the Public Works Contract have been met and any remaining monies (retainage) due to the contractor may be released for the Final Payment.

1.4. QUALITY ASSURANCE – CONSTRUCTION CLOSEOUT

A. All contractors shall be responsible for properly executing the construction closeout requirements associated with their Work as described in the specifications governing their Work.

B. The GC shall be responsible for all of the following:

1. Ensuring that all contractors have met the construction closeout requirements associated with their Work.
2. Coordinate the collection of all construction closeout deliverables from all contractors, provide the deliverables to the Project Architect and City Project Manager for review as necessary, and ensure all contractors correct deficiencies of deliverables and resubmit as needed for final acceptance.
3. Ensure all closeout requirements identified in the Construction Closeout Checklist below have been completed as intended by the construction documents.

1.5. QUALITY ASSURANCE – CONTRACT CLOSEOUT

A. The City of Madison, Department of Civil Rights (DCR) monitors contract compliance for construction and procurement contracts to ensure that local, state and federal regulations are followed by contractors working on City of Madison Public Works (PW) projects. DCR will monitor all PW projects from contract award through the final payment at the close of the project. Contractors will be required to submit reporting paperwork throughout the PW project process.

1. Contractors are encouraged to visit the web site identified below for additional information, checklists, forms, and other information provided by DCR as it relates to Contract Compliance.
   http://www.cityofmadison.com/Business/PW/contractCompliance.cfm
2. Questions regarding the process should be directed to parties and offices as identified on the various forms, documents, and instructions or contact:
   City of Madison, Department of Civil Rights
   210 Martin Luther King Jr. Blvd., Room 523
   Madison, WI 53703
   (608) 266-4910

B. All Sub-Contractors have submitted the applicable required documents described in item 1.5.D below to the General Contractor (GC) for Contract Closeout.

C. The GC has submitted the required applicable documents described in item 1.5.D below for all contractors to the appropriate City of Madison Agency per instructions associated with each submittal.

D. The documents required for submittal to the City of Madison for Contract Closeout may include any/all of the items listed below depending on contract type. It is the sole responsibility of all contractors to know and submit the required and complete documentation in a timely fashion.

1. Weekly Payroll Reports
2. Employee Utilization Reports
3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination[e1]
5. Documentation required for Small Business Enterprise (SBE) goals
6. 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 Contract Closeout-Miscellaneous Documents Library on 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.

Title	Specification	Description	Responsibility	Completed
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, PA, 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.
b. The second meeting shall be held at the 70% Contract Total Payment milestone. This meeting shall review the contractors progress regarding the closeout checklist, begin making plans for upcoming deadlines such as scheduling training, where to put attic stock, and when they are due with respect to progress payments.

2. The GC, PA, and CPM, shall utilize the Construction Closeout checklist to ensure that all construction closeout requirements have been met.

3.3. CONSTRUCTION CLOSEOUT PROCEDURE

A. Upon successful completion and final acceptance of all Construction Closeout Requirements the GC may submit to the CPM and PA the request for Final Progress Payment (100% contract total, less retainage).

B. The PA will confirm with the design consultants, CPM, and other City of Madison staff that all requirements of the Work have been completed and will do the following:
1. Approve the final progress payment application
2. Provide the required signed payment documents to the CPM
3. Provide the required Letter of Substantial Compliance to the following as required:
a. State Safety and Building Division
b. Local Building Inspection office
c. GC
d. CPM

C. The CPM shall draft the City Letter of Substantial Completion for signature by the City Engineer. This letter shall state any of the following that may still be tied to the contract and/or warranty:
1. Indicate that the date of the letter shall also be the beginning of the Warranty period.
2. Indicate any allowed due outs, reasons for them, and anticipated dates of finalization.
a. QMO issues such as off season testing of equipment
b. Off season training of equipment

D. The GC and all subcontractors shall finalize all warranty letters associated with their Work using the date noted on the City Letter of Substantial Completion, and provide the CPM with all warranties as described in Specification 01 78 36 Warranties. Upon receipt and final approval of the Warranties the CPM may initiate final processing of the Final Progress Payment (100% contract total, less retainage).

3.4. CONTRACT CLOSEOUT REQUIREMENTS

A. The GC and all sub-contractors shall follow all requirements associated with documenting contract compliance and provide documentation as required or requested by DCR or PW staff. All contractors are encouraged to stay current with submissions of the following documentation:
1. Weekly Payroll Reports no later than the Progress Payment equal to 50% of the contract total.
2. Employee Utilization Reports
3. Agent or Subcontractor Affidavit of Compliance with Prevailing Wage Rate Determination
4. Prime Contractor Affidavit of Compliance with Prevailing Wage Rate Determination
5. Documentation required for Small Business Enterprise (SBE) goals
6. Other documents as maybe required or requested through the Finalization Review Process

B. Near the Progress Payment equal to 80% of the contract total the GC shall request in writing a Finalization Review. At that time DCR or PW staff shall prepare a report of all contract documentation submitted to date. A list of missing items or outstanding issues will be emailed to the GC. <u>No additional follow-up will be generated by DCR or PW Staff</u>.

3.5. CONTRACT CLOSEOUT PROCEDURE

A. The Contract Closeout Procedure will not begin until the Construction Closeout Procedure has been completed.

B. When the GC feels he/she has successfully met all of the Contract Closeout Requirements associated with Section 3.3 above the GC may submit to the request for Final Payment to the CPM.

C. The CPM shall sign and submit the Final Payment request for processing.

D. DCR and PW staff shall do a complete review of all documentation associated with item 3.3.A above.

E. The GC shall be notified directly by DCR or PW Staff of any documentation that may still be missing, have incomplete information, or other outstanding issues. It shall be the responsibility of the GC to continue follow-up with DCR and PW staff until all documentation has been successfully submitted and accepted.

F. When all required documentation associated with Contract Closeout has been successfully submitted and accepted by DCR and PW Staff the City of Madison shall process the Final Payment of any remaining monies including retainage.

END OF SECTION

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SECTION 01 78 13
COMPLETION AND CORRECTION LIST

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 Progress 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
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

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing well documented and complete Operation and Maintenance (O&M) Data related to general facility use, equipment, systems, finishes, and materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and Custodial Personnel) as needed.

B. Operation and Maintenance Data shall apply to both of the following categories except where specific requirements are noted under their separate titles as follows:

1. Operation and Maintenance Data: Generally shall mean the owner manual that provides information on start-up, shut-down, operation, troubleshooting, maintenance, parts, and other such documentation as it pertains to all equipment and systems installed under the Work.
2. Use and Care instructions: Where applicable use and care instructions shall also be considered O&M for such things as flooring, tile, partitions, and other such finishes and trim related items, installed under the Work.

1.2. RELATED SPECIFICATIONS

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

1.3. QUALITY ASSURANCE

A. All O&M Data shall meet the requirements identified in Section 1.4 below.

B. All contractors shall provide O&M Data for each piece of equipment, system, or finish installed during the installation of the Work. O&M Data shall be provided to the General Contractor (GC) for verification and submittal.

C. The GC shall be responsible for receiving all required O&M Data files from all contractors for verifying that all files submitted meet the requirements in Section 1.4 below.

1.4. O&M DATA REQUIREMENTS

A. O&M Data shall be provided in digital PDF format as follows:

1. PDF files shall be complete first generation consumer useable editions of PDF documents as provided by any of the following:
   a. Product manufacturer
   b. Supplier of product
   c. Product manufacturer internet site

2. Acceptable PDF files shall have the following functionality:
    a. Word searchable
    b. Key areas are bookmarked
    c. Table of Contents and/or Index linked to content is preferred whenever possible.
3. Scanned printed material, with word searchable capabilities, saved as a PDF, is not acceptable and will be rejected without further review.

B. O&M Data shall include but not be limited to the following manufacturers' published information as appropriate for the equipment, system, material, or finish:
1. Installation instructions
2. Parts lists, assembly diagrams, explosion diagrams
3. Wiring diagrams
4. Start-up, shut-down, troubleshooting and other related operation procedures
5. Lubrication, testing, parts replacement, and other such maintenance procedures
6. General use, care, and cleaning instructions
7. Special precautions and safety requirements
8. A list of certified equipment vendors, service companies, parts suppliers including company name, address, and phone number
9. A list of the recommended spare parts to have on hand at all times
10. A list by type of all recommended lubes, oils, packing material, and other maintenance supplies
11. Copies of final test reports, balance reports, and other related documentation
12. Warranty information for equipment and systems

1.5. O&M DATA SUBMITTALS

A. O&M Data shall be prepared as identified in this specification and shall be submitted for review as per the schedule identified in Specification Section 01 29 76, Progress Payment Procedures.

B. O&M Data Draft submittals will be reviewed for content, procedure, and compliance only. A general critique with recommendations for improvement will be made but re-submittals will not be required.

C. O&M Data Final submittals will be reviewed for content, procedure, and compliance. Re-submittals will be required until such time as each submittal is accepted.

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

PART 2 – PRODUCTS – THIS SECTION NOT USED

PART 3 - EXECUTION

3.1. O&M DATA PREPARATION - GENERAL

A. All contractors shall prepare O&M Data for draft and final submission as follows:
1. Obtain digital PDF files for each piece of equipment, system, material or finish as described in Sections 1.4.A.1 and 1.4.A.2 above.
2. Verify that all information as described in Section 1.4.B above is included with the PDF file. Obtain missing information as necessary for a complete submittal.

B. Rename each individual PDF file as follows.
1. Do not use special characters such as #, %, &, /, etc. These characters are reserved by the Project Management Web Site software the City of Madison uses; however the under-score (or under-bar) '_' is an allowed character.
2. Use the following format and examples for renaming your file:
    a. Format: ***Equipment name_What_JUDGE DOYLE PODIUM_Contract number_Year***
        i. *Equipment Name* represents the name of any equipment, system, material or finish as designated in the Contract Documents.
        ii. *What* represents what the file is about
        iii. *JUDGE DOYLE PODIUM* represents the title of the project or contract. A shortened version of the title may be identified by the City Project Manager to be used by all contractors.
        iv. *Contract number* is the specific identification number the Work was bid under and appears on the plan set title sheet and in each sheet title block
        v. *Year* represents the year the contract will be closed out
    b. Examples of file names

i. AHU 2_Operation Manual_Fire Admin_1234_2015
ii. CPT 2_Use and Care_MPD West_9876_2011

C. All contractors shall submit the completed digital PDF files to the GC in sufficient time for the GC to meet the O&M Data submission deadlines as described in Specification Section 01 29 76, Progress Payment Procedures.

D. O&M Data shall be submitted and reviewed as described in sections 3.2 and 3.3 below.

3.2. O&M DATA DRAFT SUBMITTAL

A. All contractors shall prepare and submit the following for an O&M Data Draft review submittal:
1. Prepare three (3) complete O&M Data file samples as described in section 3.1 above.
2. Review all specifications within his/her Division of Work and prepare a complete O&M Data checklist listing all equipment, systems, materials, or finishes. Checklist shall be in tabular form similar to the example below and shall indicate the title (and plan identifier when applicable) of the O&M Data, the associated specification, and a column to verify the item has been turned in and completed.

B. The GC shall be required to review all contractors' samples and checklists for compliance with this specification and shall return any to the originating contractor that are insufficient for re-submittal.
1. When acceptable to the GC, he/she shall upload each O&M Data draft submittal file to the O&M Draft library on the Project Management Web Site.

C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the O&M Data draft submittals and checklist within fifteen 15 working days as follows:
1. Provide general critique comments by Division on O&M Data samples submitted. Critique is intended to provide all contractors with information on strengths and weaknesses of their submittals.
a. Re-submittal of the O&M Data samples will not be required.
2. Review in detail the O&M Data Checklist for completeness. Provide comments as needed.
a. Re-submittal of the O&M Checklist will be required until accepted.

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

3.3. O&M DATA FINAL SUBMITTAL

A. All contractors shall prepare and submit the following for an O&M Data Final review submittal:
1. Prepare complete O&M Data files as described in Section 3.1 above according to their approved checklist as described in Section 3.2 above.
2. Submit completed checklist and all final O&M Data files to the GC for final submittal review.

B. The GC shall be required to spot check all contractors' submittals for completeness against their checklists and for compliance with this specification and shall return any to the originating contractor that are insufficient for re-submittal.
1. When acceptable to the GC, he/she shall upload each O&M Data final submittal file to the O&M Final library on the Project Management Web Site.

C. The Project Architect, City Project Manager, CxA, Consulting Staffs and Owner Representatives shall review the O&M Data final submittals and checklist within fifteen (15) working days as follows:
1. Review the files submitted against the checklist and request any missing files through the GC.
2. Review in detail all of the O&M Data files for completeness.
a. Submittals shall be accepted or rejected as individual PDF files.
b. Contractors shall re-submit entire O&M submittal if any portion is rejected or incomplete.

3.4. CONSTRUCTION CLOSEOUT

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

END OF SECTION

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SECTION 01 78 36
WARRANTIES

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide clear responsibilities and guide lines related to providing all Warranties and Guarantees related to the Work, workmanship, materials, equipment, and other such items required by the Construction Documents.

B. Manufacturers' disclaimers and limitations on product warranties do not relieve any contractor of the warranty on the Work that includes the product.

C. Manufacturers' disclaimers and limitations on product warranties do not relieve suppliers, manufacturers and any contractor required to provide special warranties under the contract documents.

1.2. RELATED SPECIFICATIONS

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

1.3. DEFINITIONS

A. See specification 01 77 00 for the definitions of the following terms that may also be used in this specification:
1. Substantial Compliance
2. Certificate of Occupancy
3. Certificate of Substantial Completion
4. Construction Closeout
5. Contract Closeout

B. Emergency Repair: The Owner or Owner Representative reserves the right to make emergency repairs as required to keep equipment or materials in operation or to prevent damage to property and injury to persons without voiding the contractors warranty or bond or relieving the contractor of his/her responsibilities during the warranty period.

C. Installer: The company or contractor hired to install a finished product that was manufactured and supplied specifically for the Work within this contract. The Installer may or may not be the same company that supplied the product. See the definition for supplier.

D. Supplier: Any company that makes a specific finished product for the Work from information within the Contract Documents. Examples of suppliers would include custom cabinets, steel stairs and railings, etc. A supplier would not be a company that distributes items manufactured by others such as an electrical or plumbing supplier.

E. Warranty: A written guarantee from the manufacturer to the owner on the integrity of a product and its installation, and the manufacturers' responsibility to repair or replace the defective product or components within a specified time from the date of ownership. Warranty may also be used interchangeably with Guarantee. The following warranty types may be part of any specification within the Work associated with the Construction Documents:

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

A. The General Contractor (GC) shall be responsible to remedy, at his/her 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.

Title	Specification	Terms	Completed
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 JUDGE DOYLE PODIUM, 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 Section1.3.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 PA 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.

b. The Contract Closeout-Warranty Issue Library on the Project Management Web Site uses a form for each warranty issue that is logged into the system.
   i. The GC shall open each warranty issue form, review the issue description and any attached documentation or photos.
   ii. The GC shall also notify any other sub-contractor, supplier, or installer that may be required to review the warranty issue.

B. Warranty Response:
1. The GC shall upon notification by the City of Madison provide warranty response as follows:
   a. Critical Systems or equipment: Where damage to equipment and other building components, or injury to personnel is probable provide immediate emergency shut-down information and an on-site response team as soon as possible but in no case shall on-site response exceed 24 hours.
   b. For non-critical responses where damage or injury is unlikely provide on-site response no later than the next business day.
   c. Where Technical Assistance support is part of the written warranty provide all assistance necessary via phone, text, or internet systems as indicated by the warranty. If issues cannot be resolved provide on-site response no later than the next business day.
   d. If the request cannot be supported in sufficient time as outlined above the Owner (or Owner Representative) reserves the right to contact other contractors or service companies having similar capability to expedite the repair or replacement and shall invoice all associated costs to the Owner back to the GC.

C. Warranty Execution:
1. The GC shall provide all repairs or replacements as necessary to restore broken or damaged Work to the original level of acceptance as intended by the Contract Documents.
   a. Provide all materials, equipment, products, and labor necessary to complete the repair or replacement associated with the Warranty Issue.
   b. Provide all cleaning services as may be required before, during, and after the repair or replacement as per Specification 01 74 13 Progress Cleaning.
   c. Provide any protection necessary for existing construction as per Specification 01 76 00 Protecting Installed Construction
   d. Provide new letters of warranty when required.

D. Warranty Follow-up:
1. Logged Warranty Issues:
   a. The GC shall provide complete documented responses of all logged Warranty Issues. Responses shall provide a description of work completed, by who, inclusive dates, and photos of completed or repaired work.
      i. Provide call back response if work is not acceptable.
   b. The City Project Manager shall review the submitted response documentation and do a field inspection if necessary.
      i. If work is not acceptable, contact GC to review details and expectations of the repair as needed.
      ii. If work is acceptable close the Warranty Issue.
2. Quarterly Warranty Reviews:
   a. The GC shall be responsible for scheduling quarterly on-site review with all of the following:
      i. City Project Manager, and other City staff as needed
      ii. Owner and Owner Tenant Representative
      iii. Commissioning Agent (CxA)
      iv. Plumbing, Heating, Electrical Sub-contractors
      v. Other Sub-contractors that may be responsible for open Warranty issues
   b. Quarterly reviews shall be scheduled at 3 months, 6 months, and 11 months after the effective date of the warranty. The review meetings shall:
      i. Review the status of all open Warranty Issues, determine course of action and estimated date of completion.
      ii. In the appropriate quarter, provide shut-down, start-up, testing, and training of off-season equipment as required by the contract documents.
      iii. The 11th month review shall review all open Warranty Issues, final plan for resolution, and all Warranty Issues where a new letter of warranty may have been issued.

END OF SECTION

SECTION 01 78 39
AS-BUILT DRAWINGS

PART 1 – GENERAL

1.1. SUMMARY

A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they pertain to City of Madison contract procedures regarding the accurate recording of the Work associated with the execution of this contract. This shall include but not be limited to work that will be hidden, concealed, or buried.

B. Each contractor shall be responsible for maintaining an accurate record of all installations, locations, and changes to the contract documents during the execution of this contract as it may relate to their specific division or trade.

C. The General Contractor (GC) shall be responsible for ensuring all contractors provide as-built record information to the Master As-Built Document Set as described in this specification.

1.2. RELATED SPECIFICAITONS

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

1.3. RELATED DOCUMENTS

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

1.4. PERFORMANCE REQUIREMENTS

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

B. The GC shall designate one person of the GC staff to be responsible for maintaining the Master As-Built Document Set at the job trailer. This shall include, posting updates, revisions, deletions and the monitoring of all contractors posting as-built information as described in this specification.

C. All contractors shall use this specification as a general guideline regarding the requirements for documenting their completed Work. Contractors shall explicitly follow additional specification requirements within their own Division of Trade as it may apply to this specification.

1.5. QUALITY ASSURANCE

A. The GC shall be responsible for all of the following:
   a. Spot checking all sub-contractors field documents to insure daily information is being recorded as work progresses.
   b. Discuss as-built recording to the plan set at weekly job meetings with all sub-contractors on site.
   c. Schedule time with sub-contractors in the job trailer for recording as-built information to the plan set.
   d. Insure that all sub-contractors are providing clear and accurate information to the plan set in a neat and organized manner.
   e. Insure sub-contractors who have completed work have finalized recording all as-built information to the plan set before releasing them from the project site.

B. The Project Architect, the City Project Manager, Commissioning Agent and other design team staff will perform random checks of the Master As-Built Document Set during the execution of this contract to ensure as-built information is being recorded in a timely fashion as the Work progresses. An updated and current Master As-Built Document Set is a stipulation for approval of the progress payment.

PART 2 – PRODUCTS

2.1. OFFICE SUPPLIES

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

PART 3 - EXECUTION

3.1. FIELD DOCUMENT AS-BUILTS

A. The GC and all Sub-contractors shall be responsible for keeping their own field set of as-built documents including plans, specifications and published changes.

B. Field sets shall be kept dry and in good condition at all times.

C. No Work shall be buried, covered, or hidden, by any additional Work, regardless of Contractor or Trade, until locations of all materials and equipment has been properly documented as described below.

D. All contractors shall be required to record the following as-built information:
   a. Notes on the daily installation of materials and equipment.
   b. Sketches, corrections, and markups indicating final location, positioning, and arrangement of materials and equipment such as pipes, conduits, valves, cleanouts, pull boxes and other such items. Note all final locations on plan sheets, indicate dimension off identifiable building features. Riser diagrams need only be corrected for significant changes in locations, routing or configuration.
      i. The use of photographs in lieu of hand drawn sketches is acceptable.
      ii. Photos shall be taken according to Specification 01 32 33 Photographic Documentation
      iii. Print photo and markup with dimensions or notes as necessary.
   c. Identify by the use of existing plan symbology and notes the size, type, quantity, and use as applicable of materials such as pipes, valves, conduits, etc.

d. Note whether horizontal runs are below slab or above ceiling, include dimensions above or below finished floor elevation.

E. All contractors shall be responsible for transferring the information from their field set of documents to the Master As-Built Plan Set kept in the GC job trailer. See Section 3.3.D. below for the proper procedure.

F. All contractors shall update the GC Master Plan Set as often as necessary, but not less than once per work week.

3.2. SITE SURVEY AS-BUILT

A. The Land Surveyor Sub-Contractor shall provide digital as-built information including but not be limited to the following:

a. For underground buried utility laterals and services of all types locate all of the following that may apply:

i. Connection points at all mains
ii. Storm discharge points to open air
iii. All corners and bends regardless of angle, large radius sweeps shall have multiple point locations sufficient to define the sweep.
iv. All vertical drops
v. All wells
vi. Private buried utilities such as buried electrical cables, irrigation systems, etc.
v. Other information that may need to be located in the future by the owner prior to digging

b. Record all surface features including but not limited to the following:

i. Building corners, pavement edges, and other permanent structural features.
ii. All surface covers for inlets, catch basins, cleanouts, access structures, curb stops and other such devices.
iii. Other permanent surface features such as hydrants, lamp posts, and other permanent site amenities.

c. The following data shall be recorded while locating items in sub-sections 3.2.a and 3.2.b above:

i. Flow lines at both ends of pipes
ii. Pipe sizes and material types
iii. Rim elevations for all covers
iv. Sump elevations and invert elevations of all structures
v. Spot elevations for all pads, driveways, walks, stoops, and floors

B. The Surveyor shall provide the final digital as-built on a media and in a format specified in Specification 00 31 21 Survey Information to the GC for turn in to the Project Architect and the Civil Engineer.

C. The Surveyor shall provide two printed as-built site plans to the GC for inclusion in the Master As-Built Plan Set as follows:

1. One sheet to show all features (but not contour information) with text neatly organized for each item identified.
2. One sheet showing contours, contour labels, and features from item 1 above, but with no additional text.

3.3. MASTER AS-BUILT DOCUMENT SET

A. The GC shall be responsible for maintaining the Master As-Built Document Set in the job trailer at all times.

1. The Master As-Built Plan Set (Plan Set) shall begin with one complete bid set of drawings and any additional sheets that were supplied by published addenda during the bidding process. The cover sheet shall be titled as the “Master As-Built Plan Set” in large bold red letters approximately 2” in height and shall not be used for any other purpose.

a. The Plan Set shall be kept dry, legible, and in good condition at all times.

b. The Plan Set shall be kept up to date with new revisions within two (2) working days of supplemental drawings being issued. Revisions shall be posted as follows:

i. Insert new, revised sheets into the plan set. Void old sheets but do not remove them from the plan set. Indicate date received and what document (RFI, CB, CO, etc) caused the change.
ii. Insert new, revised individual details into the plan set. Void old details, tape new details over the old details with a “tape hinge” to allow them to be viewed. Indicate date received and what document (RFI, CB, CO, etc) caused the change.
iii. Add new details in appropriate white space on relevant sheets. If no space is available use the back side of the previous sheet or insert a new sheet. Indicate date received and what document (RFI, CB, CO, etc) caused the change.

c. The Plan Set shall be available at anytime for easy reference during progress meetings and for emergency location information of new work already completed.

2. The Master As-Built Specification Set (Spec Set) shall begin with one complete bid set of specifications and any additional specifications that were supplied by published addenda during the bidding process. The Spec Set shall be provided in three "D" ring type binders of sufficient thickness to accommodate the specification set. Multiple binders are allowed as necessary. Label the front cover and binding edge with "Master As-Built Specifications" in bold red letters. Provide other information as necessary to distinguish the contents of multi-volume sets.
   a. The Spec Set shall be kept dry, legible, and in good condition at all times.
   b. The Spec Set shall be kept up to date with new revisions within two (2) working days of supplemental drawings being issued.
   c. The Spec Set shall be available at anytime for easy reference during progress meetings.
3. Other Document Sets may be kept at the GCs option in three "D" ring type binders of sufficient thickness to accommodate the documentation. Other documentation sets may include but not be limited to RFIs, CBs, COs, etc.

C. The Land Surveyor Sub-Contractor shall be required to use digital surveying for all exterior site surveying, and provide deliverable digital as-builts as specified in Specification 00 31 21 Survey Information. As soon as practical the surveyor shall provide the GC with a preliminary copy of installed buried utilities for inclusion with the plan set in the job trailer. The surveyor shall provide final digital as builts as per section 3.2 above.

D. All contractors shall be responsible for updating the Plan Set from their field sets at least once per work week. Updates shall include but not be limited to the following procedures:
   a. All updates shall be done only in red ink. Place a "cloud" around small areas of correction to call attention to the change.
   b. Whenever possible place general work notes, field sketches, supplemental details, photos, and other such information on the reverse side of the preceding sheet. Installation notes including dates shall be kept neatly organized in chronological order as necessary.
   c. Accurately locate items on the plan set as follows:
      i. For items that are located as dimensioned provide a check mark or circle indicating the dimension was verified.
      ii. For items that are within 5 feet of the location indicated on the plans leave as shown and:
         - Provide correct dimensions to existing dimension strings or,
         - Accurately locate with new dimension strings
      iii. For items that are more than 5 feet from the location indicated on the plans
         - Accurately draw the items in the new location as installed and,
         - Accurately locate with new dimension strings and,
         - Note that the existing location is void.
   d. Include dimensioned locations for items that will be buried, concealed, or hidden in the ground, under floors, in walls or above ceilings.
      i. Dimensions shall be pulled from identifiable building features, not from centers of columns or other buried features.
      ii. When necessary pull more dimensions as needed from opposing directions to properly locate single items.

3.4. AS-BUILT REVIEW AND ACCEPTANCE

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

3.5. CHANGES AFTER ACCEPTANCE

A. No Contractor shall be responsible for making changes to the As-Built record documents after acceptance by the PA and CPM except when necessitated by changes resulting from any Work made by the Contractor as part of his/her guarantee.

END OF SECTION

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SECTION 01 78 43
SPARE PARTS AND EXTRA MATERIALS

PART 1 – GENERAL

1.1. SUMMARY

A. This specification is intended to provide clear guidelines and identify the responsibilities of all contractors as they pertain to City of Madison contract procedures regarding spare parts, special tools, special materials, and extra materials.

B. Each contractor shall be responsible for knowing the specific requirements of their Division Specifications as they may relate to the general information provided in this specification.

C. The General Contractor (GC) shall be responsible for ensuring all contractors provide spare parts and extra materials as described in this specification.

1.2. RELATED SPECIFICAITONS

A. 01 29 76 Progress Payment Procedures

B. 01 31 23 Project Management Web Site

C. 01 77 00 Closeout Procedures

D. Other Divisions and Specifications that may address more specifically how to proceed with spare parts, special tools, special materials, and extra materials.

1.3. DEFINITIONS

A. Spare Parts: Any component of a product or assembly that comes pre-packaged or was specially ordered for the explicit use of the product or assembly. This shall include but not be limited to fastening devices, mounting brackets, replacement parts, wheels, pulleys, wiring, alternate assembly pieces, etc.

B. Special Tools: Any tool of any kind that was pre-packaged or specially ordered, and is required to be used for the installation or maintenance of an installed product or assembly as part of this contract.

C. Special Materials: Any oil, lubricant, glue, touch-up paint, or other such material that comes pre-packaged or was specially ordered and is required to be used for the installation or maintenance of an installed product or assembly as part of this contract.

D. Extra Materials (Attic Stock): Any surplus materials in new and useable condition that was installed a part of this contract. Attic Stock shall include but not be limited to the following: ceiling tiles, paint, stain, floor coverings, ceramic tiles, light bulbs/lamps, filters, strainers, etc. Attic Stock shall include partially opened bulk items and additional unopened quantities as directed by other specifications.

1.4. PERFORMANCE REQUIREMENTS

A. All contractors shall be responsible for consolidating spare parts, special tools, special materials, and attic stock as it pertains to the specific Work within their Division or Trade.

B. All contractors shall use this specification as a general guideline regarding the requirements for turning spare parts, special tools, special materials, and attic stock over to the owner. Contractors shall explicitly follow specification requirements within their own Division of Trade.

1.5. QUALITY ASSURANCE

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.

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

PART 1 – GENERAL

1.1. SUMMARY

A. The purpose of this specification is to provide clear responsibilities and guidelines related to providing Demonstration and Training (D&T) Sessions related to general facility use, equipment, systems, finishes, and materials to City of Madison Staff (Owner, Owner Representatives, Maintenance, and Custodial Personnel) as needed.

B. All D&T shall be coordinated through the General Contractor (GC), Project Architect (PA) and City Project Manager (CPM), and will be based on or customized to the needs of City of Madison Staff being trained. New equipment and systems may have complete D&T sessions as described in this specification while equipment or systems staff is familiar with may have sessions more focused on maintenance only.

1.2. RELATED SPECIFICATIONS

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

1.3. QUALITY ASSURANCE

A. All contractors shall have the responsibility of preparing for and conducting D&T sessions as determined by this and other Division or Trade related specifications, Owner Operation and Maintenance Manuals, and other such documentation related to the Work.

B. The GC shall have responsibility for:

1. Ensuring that all contractors required to conduct a D&T session have successfully completed all of the following:
    a. Turned in all required documentation for review and documentation has been approved/accepted prior to scheduling D&T sessions.
    b. Other required documentation as needed is available and ready for use during the D&T session.
    c. All systems have been started, tested, and running as per appropriate specification and/or manufacturers recommendations prior to scheduling D&T sessions.
    d. All contractors are sufficiently prepared for their D&T session
    e. Documents the D&T session including date, time, contractor and company name, attendees and other information regarding the session
2. Organizing the coordination and scheduling of all D&T sessions between all contractors and the appropriate representatives of the Owner. These representatives may include any of the following 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, 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

9. Review of system documentation including the following:
    a. Operation and maintenance data
    b. Warranties
    c. Valve charts, tags, and pipe identification markers

B. For each piece of specialty equipment train on the following objectives/topics as applicable:
1. Manufacturers operations instructions
2. Manufacturers use and care instructions
3. Manufacturers maintenance and troubleshooting instructions
4. System operation and programming including weekly, monthly, annual test procedures
5. Identification of any correction list items still outstanding
6. Review of system documentation including the following:
    a. Operation and maintenance data
    b. Warranties

C. End User Orientation
1. Facility walkthrough
2. Security and emergency features
3. General facility operation procedures

D. Facility General Use and Custodial Services – if requested
1. Facility walkthrough
2. Security and emergency features
3. General facility operation procedures
4. Care and maintenance of specialty items, finishes, etc as requested
5. Attic stock inventory and material designations

3.4. DEMONSTRATION AND TRAINING PROGRAM PREPARATION

A. Each contractor having a responsibility for providing D&T sessions shall meet with the GC, CPM, and other City Staff as needed to review the extent of the Training Objectives in section 3.3 above needed for each piece of equipment, system, finish, etc. This meeting shall occur no less than four (4) weeks prior to the anticipated training session.

B. The contractor shall use the information from item 3.4.A above to prepare a formal training program for each piece of equipment or system based on the Training Objectives in 3.3 above.
1. The formal training program shall include the following information:
    a. Session title
    b. List of systems, equipment, use, care, etc to be covered during the session
    c. Provide the following for each systems, equipment, use, care, etc to be covered during the session
        i. Name and affiliation of each instructor to be used. As needed and discretion of the Owner the GC to require attendance by the installing technician, installing Contractor and the appropriate trade or manufacturer's representative.
        ii. Qualifications of each instructor to be used. Practical building operation expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment as installed in this project is required by the training personnel. If Owner determines training was not adequate, the training shall be repeated until acceptable to Owner.
        iii. A checklist of all documentation and system/equipment requirements necessary to complete a successful training session and the current status of each
        iv. Any additional documents, training aids, video or other items to be used to complete the training
        v. Any special requirements or needs associated with item iv above to complete the training
    d. The intended audience for the training
    e. The approximate duration of each objective or topic to be covered
2. Submit the completed training program to the GC for review and approval by the PA and CPM.

C. The PA and CPM shall work with staff as necessary to ensure all points of anticipated training needs have been met. The PA and CPM will approve the program as submitted or recommend changes for re-submittal as necessary.

3.5. CONDUCTING A DEMONSTRATION AND TRAINING SESSION

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

b. Provide an overview of the training to be conducted including the approximate schedule.

2. Conduct a general walk-through of the site.
   a. Point out locations of various equipment, valves, charts, and other related items.
   b. Use the Division or Trade As-Built record drawings to indicate locations of hidden or buried items.
3. Provide a demonstration of general equipment/system operation including using the O&M manual.
   a. Startup and shutdown procedures.
   b. Normal operational levels as depicted by any gauges, software, etc.
   c. Indicate warning devices, signs etc. and demonstrate emergency shut-down procedures.
4. Provide a demonstration of all owner level maintenance using the O&M manual.
   a. Indicate frequency of maintenance.
   b. Provide and review all spare parts, special tools, and special materials.
5. Provide and review all spare parts, special tools, special materials, or attic stock as applicable.
6. While conducting D&T sessions:
   a. Allow hands on training whenever practical.
   b. Answer questions promptly
   c. Repeat demonstrations and procedures as necessary.

B. Within two (2) working days of completing the D&T session the contractor responsible for the session shall turn-in any documentation generated including the sign in roster to the GC.

C. The GC shall turn over all training documentation to the PA and CPM upon completion of D&T sessions.

D. Re-schedule any training that has been determined to be inadequate or inappropriate for any reason including but not limited to any of the following;
   1. Unqualified instructor
   2. System installation incomplete or untested to the specifications
   3. Equipment failure during demonstration
   4. Un-expected cancellation

3.6. CLOSEOUT PROCEDURE

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

END OF SECTION

SECTION 01 81 13.13
SUSTAINABLE DESIGN REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with certain Parksmart Certification Standard prerequisites and credits needed for Project to obtain Bronze certification based on Parksmart Certification Standard Version 1.0 with Addenda.
   1. Other Parksmart prerequisites and credits needed to obtain Parksmart certification depend on product selections and may not be specifically identified as Parksmart requirements. Compliance with requirements needed to obtain Parksmart prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
   2. A copy of Parksmart Project checklist is attached at the end of this Section for information only.
      a. Some Parksmart prerequisites and credits needed to obtain the indicated Parksmart certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

1.2 DEFINITIONS

A. Parksmart Certification Standard Version 1.0 with Addenda.
   1. Definitions that are a part of "Parksmart Certification Standard" apply to this Section.

1.3 PRE-INSTALLATION MEETINGS

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

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect about Parksmart prerequisites and credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until a determination on Project's Parksmart certification application. Document responses as informational submittals.
B. Submit documentation to Parksmart and respond to questions and requests from Parksmart about Parksmart prerequisites and credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until Parksmart has made its determination on Project's Parksmart certification application.

1. Document correspondence with Parksmart as informational submittals.

1.5 ACTION SUBMITTALS

A. Sustainable Design Documentation Submittals:
   1. Product Data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over time.
   2. Product Data for recycled content indicating postconsumer and pre-consumer recycled content and cost.
   3. Product Data 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.
   4. IAQ (Refer to Section 01 57 19.11 - Indoor Air Quality (IAQ) Management):
      a. Construction indoor-air-quality management plan.
      b. Product Data for temporary filtration media.
      c. Product Data for filtration media used during occupancy.
   5. Product Data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
   6. Product Data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
   7. Product Data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.6 INFORMATIONAL SUBMITTALS

A. Sustainable Design Action Plans: Provide preliminary submittals within 14 days of date established for the Notice to Proceed indicating how the following requirements will be met:
   1. List of proposed materials with recycled content. Indicate cost, postconsumer recycled content, and pre-consumer recycled content for each product having recycled content.
   2. List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
   3. Construction indoor-air-quality management plan.

B. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

1.7 QUALITY ASSURANCE

A. Parksmart Coordinator: Engage an experienced LEED-Accredited Professional to coordinate Parksmart requirements. Parksmart coordinator may also serve as waste management coordinator.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain Parksmart credits required in this Section. Although other Sections may specify some requirements that contribute to these Parksmart credits, Contractor shall provide additional materials and procedures necessary to obtain Parksmart credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Building materials shall have recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 10 percent of cost of materials used for Project.
   1. Cost of postconsumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of postconsumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

2. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Not less than 50 percent of building materials (by cost) shall be regional materials.

2.4 LOW-EMITTING MATERIALS

A. For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   1. Flat Paints and Coatings: VOC not more than 50 g/L.
   2. Non-flat Paints and Coatings: VOC not more than 150 g/L.
   3. Dry-Fog Coatings: VOC not more than 400 g/L.
   4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
   5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
   6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
   7. Pretreatment Wash Primers: VOC not more than 420 g/L.
   8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
   9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
   10. Floor Coatings: VOC not more than 100 g/L.
   11. Shellacs, Clear: VOC not more than 730 g/L.
   12. Shellacs, Pigmented: VOC not more than 550 g/L.
   13. Stains: VOC not more than 250 g/L.

PART 3 – EXECUTION

3.1 NON-SMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

3.2 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
   1. Replace air filters immediately prior to occupancy.

3.3 INDOOR-AIR-QUALITY ASSESSMENT

A. Flush-Out (Enclosed spaces only):
   1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. (4 300 000 L) of outdoor air per sq. ft. (sq. m) of floor area while maintaining an internal temperature of at least 60 deg F (16 deg C) and a relative humidity no higher than 60 percent. Per the Mechanical Engineer, time required for this flush out is 18 days at 24 hours a day.

END OF SECTION

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SECTION 01 81 13.15
PARKSMART CERTIFICATION TARGET

Elements of Parksmart Certification

Technology and Structure Design	Max Points	Points achievable
Idle Reduction Payment Systems	4	4
Fire Suppression Systems	2	2
No/Low VOC Coatings, Paints, Sealants	2	2
Tire Inflation Stations	2	0
EV Charging Stations	6	4
HVAC Systems - Occupied Spaces	6	5
Ventilation Systems - Parking Decks	6	4
Lighting Controls	8	7
Energy-efficient Lighting System	8	8
Stormwater Management	6	0
Rainwater Harvesting	4	0
Greywater Reuse	2	0
Indoor Water-efficiency	2	2
Water-efficient Landscaping	2	0
Roofing Systems	6	0
Renewable Energy Generation	12	0
Design for Durability	6	6
Energy Resiliency - Storage	4	0
Total Technology & Structure Design Points	**88**	**44**
Management	**Max Points**	**Points achievable**
Parking Pricing	6	6
Shared Parking	6	0
TMO/TMA	4	0
Recycling Program	4	3
Sustainable Purchasing Program	2	2
Proactive Operational Maintenance	6	6
Cleaning Procedures - Occupied Spaces	2	0
Cleaning Procedures - Parking Decks	6	3
Building Systems Commissioning	8	6
Construction Waste Management	6	4
Regional Materials	6	6
Regional Labor	4	1
Reused/Repurposed/Recycled Materials	6	6
Third Party Sustainability Certification	12	0
Credentialed Management	4	0
Life-cycle Assessment	8	8

1

Total Management Points	**90**	**51**
Programs	**Max Points**	**Points achievable**
Placemaking	6	0
Access to Mass Transit	4	0
Wayfinding Systems - External	4	1
Wayfinding Systems - Internal	4	2
Traffic Flow Plan	4	4
Carshare Program	6	0
Rideshare Program	6	2
Low-emitting and Fuel-efficient Vehicles	4	2
Alternative Fuel Vehicles	6	0
Alternative Fuel Fleet Vehicles	4	2
Bicycle Parking	6	4
Bicycle Sharing/Rental	6	4
Marketing/Educational Program	4	0
Total Programs Points	**64**	**21**
Innovation	**Max Points**	**Points achievable**
Innovative Approach	6	0
Total Innovation Points	**6**	**0**
Total Parksmart Points	**248**	**116**
Parksmart Award Levels / Existing Facilities		
Certification level	Points	
Parksmart Pioneer	90+	
Required minimums in Management, Programs and Technology & Structure Design categories: 15 in each category		
Parksmart Award Levels / New Construction		
Certification level	Points	
Parksmart Bronze	110 - 134	116
Parksmart Silver	135 - 159	
Parksmart Gold	160+	

2

3 **END OF SECTION**

SECTION 01 91 00
COMMISSIONING

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 95 00	Measurement & Verification
M.	Section 23 05 93	Testing, Adjusting, and Balancing for HVAC
N.	Section 23 09 00	Instrumentation and Control for HVAC
O.	Section 23 09 23	Direct Digital Control (DDC) System for HVAC
P.	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”.
C. NEBB – Procedural Standards for Building Systems Commissioning.

1.4 DEFINITIONS

A. Acceptance Phase. Phase of construction after startup and initial checkout when functional performance tests are performed.
B. Commissioning Authority (CxA). An independent entity, not otherwise associated with the A/E team members or the Contractor and reports directly to the Owner. The CxA directs and coordinates the commissioning activities.

C. Commissioning Plan (Cx Plan). An overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process. The Cx Plan is included in the bid documents and is to be reviewed by all contractors before submitting their bid.

D. Contract Documents. The documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.).

E. Construction Checklist (CC). a list of items to inspect and test equipment and components to verify proper installation of equipment. The CCs are provided by the CxA to the Sub.

F. Datalogging. - Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

G. Deferred System Performance Tests. SPT's that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that prevent the tests from being performed earlier.

H. Deficiency. A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the Owner's Project Requirements).

I. Factory Testing. Testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

J. Indirect Indicators. Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

K. Manual Test. Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

L. Monitoring. Recording parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

M. Over-written Value. Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 75F to 50F to verify economizer operation). See also "Simulated Signal."

N. Owner's Project Requirements (OPR). A document that describes what the Owner and stakeholders want to achieve with this project and what expectations they have of the completed project.

O. Sampling. Reviewing or testing only a fraction of the total number of identical or near identical pieces of equipment.

P. Seasonal Performance Tests. SPT's that are deferred until the system(s) will experience conditions closer to their design conditions.

Q. Simulated Condition. Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

R. Simulated Signal. Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

S. System Performance Test (SPT). Dynamic testing of entire systems (rather than just components of the system) under full operation.

T. Trending. Monitoring of control points using the building automation system.

1.5 DESCRIPTION

A. General: Commissioning (Cx) is a systematic process of verifying that all building systems perform interactively to meet the Owner's Project Requirements (OPR). This is achieved by beginning in the planning phase with documenting the OPR and continuing through design, construction, acceptance, and the warranty period with verification of performance. The Cx process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, tesTing and balancing, performance testing and training. Cx during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation is complete.
4. Verify that the Owner's operating personnel are adequately trained.

B. The Cx process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. The commissioning authority (CxA) has no authority to change, modify or direct any work. The CxA can only provide comments and suggestions.

D. Commissioning Plan. The Cx Plan provides guidance in the execution of the Cx process. The CxA will update the Cx Plan regularly as the project progresses. The Drawings and Specifications will take precedence over the Cx Plan.

1.6 RESPONSIBILITIES

A. General Contractor (GC) and Subcontractors (Subs)

1. Construction and Acceptance Phase
   a. Provide assistance to the Construction Manager CM in the coordination of the Cx work by the CxA, and with the CM and CxA ensure that Cx activities are being scheduled into the master schedule.
   b. Provide an updated construction schedule to the CxA any time the schedule changes.
   c. Include the Cx activities in the contract.
   d. Furnish a copy of all submittals and shop drawings pertaining to the commissioned systems for review concurrently with the Architect and Engineers.
   e. Furnish a copy of all construction meeting agendas and minutes to the CxA.
   f. In each purchase order or subcontract written, include requirements for submittal data, O&M data, Cx tasks and training.
   g. GC will ensure that all Subs execute their Cx responsibilities according to the Contract Documents and schedule.
   h. 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.
   i. Coordinate and execute the training of Owner personnel.
   j. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
   k. 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.
   l. 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.
   m. Complete all construction checklist and functional performance test forms as required by the Cx process.
   n. Support the CxA with verification of the completion of construction checklist and functional performance tests as outlined in PART 3.
   o. Complete and inspect all installations. Certify that all components and systems are operating as intended per Contract Documents.
   p. Remedy all deficiencies immediately as they are identified throughout construction.
   q. Demonstrate functionality of all systems and equipment.
   r. Maintain an updated set of record drawings (on a daily basis) on the construction site.
   s. Provide support and instrumentation to verify TAB reports, start-up reports, calibration reports, and any other report pertinent to the commissioned equipment and systems.
   t. Notify the CxA no less than 21 days before all testing, start-up, and training.
   u. Update the CxA on a weekly basis on the progress of the Cx activities.
   v. Submit trend data in electronic format or allow access to trending data by internet connection as requested by the CxA.
   w. 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.

B. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. 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 base

bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CxA.

4. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.

1.7 SYSTEMS TO BE COMMISSIONED

A. The entire Heating, Ventilation and Air Conditioning (HVAC) system (boilers, chillers, pumps, piping and air distribution systems)
B. Building Automation System (BAS) for the HVAC system
C. Domestic Hot Water
D. Building envelope and roofing system as it pertains to HVAC
E. Lighting and Lighting Controls
F. Emergency Power System

PART 2 – PRODUCTS

2.1 TEST INFORMATION

A. All instruments needed to verify sensor readings, component performance, and system performance will be provided by GC and Subs and be available to the CxA. These instruments will not be beyond what the contractors need to complete the work specified in these construction documents. Any data logging equipment required in addition to the BAS will be provided by the CxA.
B. All instruments shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Contract Documents. Refer to specification section 23 05 93- Testing, Adjusting, and Balancing for required instrument tolerances.

PART 3 - EXECUTION

3.1 COMMISSIONING TEAM

A. The members of the commissioning team consist of the Commissioning Authority (CxA), the Owner's Project Manager (PM), the designated representative of the Owner's Construction Management team (CM), the General Contractor (GC or Contractor), the architect and design engineers, the Mechanical Contractor, the Electrical Contractor, the TAB Contractor, the Controls Contractor, any other installing subcontractors or suppliers of equipment.
B. Each Cx Team member shall designate one person who is responsible for coordinating the commissioning efforts with the CxA.

3.2 SCHEDULING AND MEETINGS

A. Scheduling. The CxA will work with the other members of the Cx Team according to established protocols to schedule the Cx activities. The CxA will provide sufficient notice to the Cx Team for scheduling Cx activities. The GC will integrate all Cx activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the Cx process.
B. The CxA will provide the initial schedule of primary Cx events at the Cx pre-construction meeting. The Cx Plan provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Cx Plan also provides a format for detailed schedules.
C. Pre-Construction Meeting. Within 60 days of selection of the GC, the CxA will schedule, plan, and conduct a Cx pre-construction meeting with the entire Cx team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the Cx Plan which will also be distributed to all parties.
D. Meetings. The Cx meetings will be scheduled approximately once a month during construction. These meetings will be scheduled directly before or after the regular construction meetings if practical. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs

3.3 REPORTING

A. The CxA will provide regular reports to the Owner as construction and Cx progresses. Standard forms are provided and referenced in the Cx Plan.

B. The CxA will regularly communicate with all members of the Cx team, keeping them apprised of Cx progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

3.4 RECORD DRAWINGS

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

3.5 CONSTRUCTION COMMISSIONING PROCEDURES

A. The following procedures apply to all equipment to be commissioned.

B. General. Construction checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that system performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full checkout. No sampling strategies are used. All construction checklists for a given system must be successfully completed prior to formal system performance testing of equipment or subsystems of the given system.

C. Construction Checklists.

1. The primary purpose of the construction checklists is to provide the individual workers with the key criteria for a successful installation. The secondary purpose is to track the progress of the delivery and installation.
2. The CxA will develop construction checklists for all commissioned equipment and distribute these to the responsible contractor. The GC and Subs will review the construction checklists for each equipment type and provide comments to the CxA. The CxA will then print and distribute the construction checklist for each individual component.
3. The GC and Subs are responsible for all requirements in the specification, not only the requirements listed on the checklists.
4. The checklists answer format will be to circle yes /no or provide a brief answer such as providing the model or serial numbers.
5. These checklists are provided by the CxA to the GC. The GC determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form may have more than one trade responsible for its execution.
6. The construction checklists shall be completed as delivery is completed and the installation progresses.
7. Only individuals who have direct knowledge and witnessed that a line item task on the construction checklist was actually performed shall initial or check that item off. It is not acceptable for supervisors without direct knowledge or who have not witnessed the line item task on the construction checklist to fill out these forms.
8. Any negative response shall immediately be brought to the attention of the CxA. All negative replies shall be explained in detail on the construction checklist.
9. The GC and Subs are responsible for recording the completion of the checklists. Checklists shall be submitted electronically to SharePoint in .pdf format in separate files by Division. Each file shall be bookmarked by checklist tag.
10. Non-itemized installations such as wiring, ductwork, piping etc. will not have checklists to be completed, but the GC and Subs will be provided the key criteria for successful installation.
11. The CxA will verify the construction checklist completion by a sampling of the delivered and installed equipment. The sampling process will be described in the Cx Plan.

D. Sensor Calibration. Calibration of all sensors shall be included as part of the construction checklists performed by the Contractors. Calibration information is provided in specification Section 23 09 23 - Direct Digital Control System for HVAC

E. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the construction checklist that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of task completion.
2. The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM. The CxA shall work with the Subs and vendors to correct deficiencies or

uncompleted items. The CxA will involve the CM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and include a Statement of Correction on the original non- compliance report. When satisfactorily completed, the CxA recommends approval of the completion of the checklists to the CM using a standard form.

3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party.

F. System Performance Tests (SPT). SPTs shall be performed to demonstrate that each system is operating according to the documented OPR and Contract Documents. System testing differs to the tests required in the Construction Checklist in that they facilitate bringing all the individual components together to verify that they operate collectively on a system level to provide the required design conditions.

1. Development of Test Procedures. The CxA shall prepare the SPT forms and procedures in accordance with the criteria defined in the Cx Plan. The GC and Subs shall assist the CxA in the preparation of these procedures by answering queries and forwarding site-specific information. A sample System Performance Test form is provided at the end of this specification section.
2. Participation: The GC and the Subs are responsible for testing all systems to be commissioned such that they function as described in the contract documents. The CxA will verify the performance of the systems. The CxA will direct, witness and document the SPT verification and GC and Subs will execute the verification tests.

G. Problem Solving. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

H. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and record documents due to the testing will be made.

I. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the PM. These tests will be conducted in the same manner as the seasonal tests.

3.6 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gages, 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.

3.7 NON-CONFORMANCE

A. All deficiencies or non-conformance issues shall be noted and reported by the GC to the CM on a standard non-compliance form.

B. 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.

C. 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 and the Owner.

D. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.
1. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
a. 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.
b. The CxA reschedules the test and the test is repeated.
2. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

a. 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.
b. 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.
c. The CxA documents the resolution process.
d. 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.

3. Cost of Retesting.
a. The cost incurred by the Subs to retest a construction checklist item 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 construction 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 construction 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 installation or test.
d. The Contractor shall respond in writing to the CxA and CM at least as often as Cx meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during Cx. Discussion shall cover explanations of any disagreements and proposals for their resolution.
e. The CxA retains the original non-conformance forms until the end of the project.
f. 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 PM. In such case, the Contractor shall provide the Owner with the following:
g. Within one week of notification from the CM or PM, 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 PM within two weeks of the original notice.
h. 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. The CM or PM will determine whether a replacement of all identical units or a repair is acceptable.
i. 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 PM will decide whether to accept the solution.
j. 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.

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

END OF SECTION

SECTION 01 95 00
MEASUREMENT AND VERIFICATION

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. M&V - Measurement and Verification
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 M&V activities including, but not limited to, the following:

1. Follow activities identified in the M&V Plan.
2. Coordinate connection of gas and DHW monitoring equipment with BAS.
3. Cooperate with the M&V Provider and Controls Contractor for resolution of issues related to data collection.
4. Attend team meetings during construction and post-construction M&V 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 M&V activities including, but not limited to, the following:

1. Follow activities identified in the M&V Plan.
2. Coordinate connection of electrical monitoring equipment with BAS

3. Cooperate with the M&V Provider and Controls Contractor for resolution of issues related to data collection.
4. Attend team meetings during construction and post-construction M&V 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 M&V activities including, but not limited to, the following:
1. Follow activities identified in the M&V Plan.
2. Coordinate connection of electrical, gas, and DHW monitoring equipment with BAS
3. Cooperate with the M&V 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 M&V period (1 year).

1.6 M&V PROVIDERS RESPONSIBILITIES

A. Providers responsibilities include:
1. Organize and lead the M&V team.
2. Provide M&V plan.
3. Convene M&V 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 M&V report at 1 year post construction.

PART 2 – PRODUCTS – THIS SECTION NOT USED

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.

3.4 TEMPORARY MONITORING

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

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

3.5 DDC TRENDS

A. The Controls Contractor is to provide provision for remote access to BAS to view status of building and the ability to download trendable points.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:
   1. Footings.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Suspended slabs.
   5. Concrete toppings.
   6. Building frame members.
   7. Building walls.

B. Related Requirements:
   1. Section 03 38 16 "Unbonded Post-Tensioned Concrete".
   2. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

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

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

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.
   2. Review special inspection and testing and inspecting agency procedures for field quality control, early strength determination procedures, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.
   3. Hold pre-construction conference two weeks prior to first placement of low shrinkage concrete. Agenda for meeting shall include concrete handling, placing, finishing, curing, and optimum working conditions to coordinate this work with related and adjacent work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer 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. Laboratory Test Reports: For liquid floor treatment and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.

C. Design Mixtures: Prior to beginning the work and within 14 days of the notice to proceed, the Contractor shall submit to the Engineer, for review, previous independent laboratory generated data detailing performance (measures of performance as defined below) of the proposed mix design. Contractor shall also

provide certification that materials used and their proportions are to be essentially unchanged from the mixture for which the data was generated. If independent laboratory data is not available, the proposed mix design shall be checked by an independent laboratory acceptable to the Engineer. All costs related to such testing shall be borne by the Contractor. Since laboratory trial batches require 35 calendar days to complete, the Contractor may consider testing more than one mix design for each class of concrete. Include the following information for each mix design:

1. Water / cementitious materials ratio.
2. Slump as per ASTM C 143
3. Air content as per ASTM C 231 (pressure method), or ASTM C 173 (volumetric method)
4. Unit weight of concrete as per ASTM C 138
5. Compressive strength at 3, 7, and 28 days per ASTM C 39
6. Shrinkage (length change) as measured in accordance with section 1.8.117 B of this specification

D. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mixing water to be withheld for later addition at Project site.

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

F. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   1. Location of construction joints is subject to approval of the Architect.

G. Coordinated slab opening/embedded utilities shop drawings: placing drawings that dimension all slab openings, box-outs, and sleeves required by other trades, and size and locate all embedded elements not specified on the structural drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Fiber reinforcement.
   6. Waterstops.
   7. Curing compounds.
   8. Floor and slab treatments.
   9. Bonding agents.
   10. Adhesives.
   11. Vapor retarders.
   12. Semirigid joint filler.
   13. Joint-filler strips.
   14. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:
   1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

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

G. Field quality-control reports.

H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.
F. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
   1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
G. Manufacturer’s Representative: A representative of the admixture manufacturer shall be present during initial concrete placement. Engineer may waive requirement for manufacturer’s representative if Contractor provides sufficient evidence that Producer and Finisher have adequate experience with admixtures required.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.
B. Shrinkage Testing Procedure: Testing and reporting shall conform to ASTM C 157-93 with the following modifications:
   1. Wet cure specimens for a period of 7 days (including the period of time the specimens are in the mold). Wet cure may be achieved either through storage in a moist cabinet or room in accordance with ASTM C 511, or through storage in lime saturated water.
   2. Slump of concrete for testing shall match job requirements and need not be limited to restrictions as stated in ASTM C 157 section 7.4.
   3. Report results in accordance with ASTM C 157 at 0, 7, 14 & 28 days of drying.

1.9 DELIVERY, STORAGE, AND HANDLING

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

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and as follows:
   1. Maintain concrete temperature below 95 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 – PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.
   2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.
   2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. High-density overlay, Class 1 or better.
      b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
      c. Structural 1, B-B or better; 230 mill oiled and edge sealed.
      d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

F. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

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

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706, deformed.

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

E. Epoxy-Coated Wire: ASTM A 884, Class A, Type 1 coated, as-drawn, plain steel wire, with less than 2 percent damaged coating in each 12-inch wire length.

F. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884, Class A coated, Type 1, plain and deformed steel.

G. Headed Shear Stud Reinforcement: ASTM A 1044.

2.4 REINFORCEMENT ACCESSORIES

A. Epoxy-Coated Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, ASTM A 775 epoxy coated.
B. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.
C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
    1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
    2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 500 miles of Project site.
B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
C. Cementitious Materials:
    1. Portland Cement: ASTM C 150/C 150M, Type I.
    2. Fly Ash: ASTM C 618, Class F or C.
    3. Slag Cement: ASTM C 989, Grade 100 or 120.
    4. Silica Fume: ASTM C 1240, amorphous silica.
D. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
    1. Maximum Coarse-Aggregate Size: 3/4-inch nominal.
    2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
E. Air-Entraining Admixture: ASTM C 260.
F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
    1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
    2. Retarding Admixture: ASTM C 494/C 494M, Type B.
    3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
    4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
    5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
    6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
G. Shrinkage Reducing Admixture (SRA): ASTM WK23938, with testing per section 1.8.B of this specification (ASTM C 157 and ASTM C 511.)
    1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
        a. GCP Applied Technologies (formerly W.R. Grace & Co.) Eclipse 4500.
        b. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
H. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
    1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
        a. BASF Corporation; Construction Systems; MasterLife CI 30
        b. Euclid Chemical Company (The); an RPM company; EUCON BCN or EUCON CIA.
        c. GCP Applied Technologies (formerly W.R. Grace & Co.); DCI.

d. Sika Corporation; Sika CNI.
e. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

I. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
a. BASF Corporation; Construction Systems; MasterLife CI 222.
b. GCP Applied Technologies (formerly W.R. Grace & Co.); DCI-S.
c. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

J. Water: ASTM C 94/C 94M and potable.

2.6 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
a. Euclid Chemical Company (The); an RPM company; [Tuf-Strand Max Ten] [Tuf-Strand SF].
b. FORTA Corporation; FORTA FERRO.
c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Strux 90/40.
d. Nycon, Inc.; [Nycon-XL] [Nycon-XL-100] [Nycon-XL-200] [Nycon-XL-Plus].
e. Propex Operating Company, LLC; [Enduro 600] [Fibermesh 650].
f. Sika Corporation; [Sika Fiber MS] [Sika Fiber MS10].
g. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.7 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
1. 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. BoMetals, Inc.
b. Paul Murphy Plastics Company.
c. Sika Greenstreak.
d. Vinylex Waterstop & Accessories.
e. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
2. Profile: Ribbed with center bulb.
3. Dimensions: 6 inches by 3/8-inch thick; non-tapered.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
a. Barrier-Bac; Inteplast Group, Ltd.; Waterstop.
b. Carlisle Coatings & Waterproofing 349 Inc; MiraSTOP.
c. CETCO, a Minerals Technologies company; Waterstop-RX-101.
d. Concrete Sealants Inc.; Conseal CS-231.
e. Henry Company, Sealants Division; Hydro-Flex.
f. JP Specialties, Inc.; Earth Shield Type 20.
g. Sika Greenstreak; Swellstop.
h. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.8 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class C [, except with maximum water-vapor permeance of <Insert rating>]. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
      a. Insulation Solutions, Inc.; Viper VaporCheck II 10 mil.
      b. Raven Industries, Inc; Vapor Block VB6.
      c. Reef Industries, Inc; Griffolyn Type-65.
      d. Stego Industries, LLC; Stego Wrap, 10 mil Class C.
      e. Tex-Trude, Inc.; Xtreme 10 mil Class C.
      f. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
      a. AWRC Corporation; AMERI-SHIELD Shield-Proof.
      b. BASF Corporation; Construction Systems; [MasterKure HD 200 WB (Pre-2014: Kure-N379 Harden)] [MasterKure HD 300 WB (Pre-2014: Lapidolith)].
      c. ChemMasters, Inc; Chemisil Plus.
      d. ChemTec Int'l; ChemTec One.
      e. Curecrete Distribution Inc.; Ashford Formula.
      f. Dayton Superior; [Pentra-Hard Densifier] [Pentra-Hard Finish] [Pentra-Hard Guard] [Sure Hard Densifier J17].
      g. Euclid Chemical Company (The); an RPM company; [Euco Diamond Hard] [Eucosil].
      h. Kaufman Products, Inc; SureHard.
      i. L&M Construction Chemicals, Inc; Seal Hard.
      j. Metalcrete Industries; Floorsaver.
      k. NewLook International, Inc.; Drivehard Pro.
      l. Nox-Crete Products Group; Duro-Nox.
      m. PROSOCO, Inc; Consolideck LS.
      n. SpecChem, LLC; SpecHard.
      o. US SPEC, Division of US MIX Company; US SPEC Industraseal.
      p. Vexcon Chemicals Inc.; Vexcon StarSeal PS Clear.
      q. W. R. Meadows, Inc; [INTRAGUARD] [LIQUI-HARD].
      r. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
   2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

a. BASF Corporation; Construction Systems; Confilm.
b. Bon Tool Co.; 32-301-B7 BonWay Evaporation Retarder.
c. Brickform; a division of Solomon Colors; Evaporation Retarder.
d. ChemMasters, Inc; Spray-Film.
e. Dayton Superior; [AquaFilm Concentrate 408 J74] [AquaFilm J74RTU].
f. Euclid Chemical Company (The); an RPM company; Eucobar.
g. Kaufman Products, Inc; VaporAid.
h. L&M Construction Chemicals, Inc; E-CON.
i. Lambert Corporation; LAMBCO Skin.
j. Metalcrete Industries; Waterhold.
k. Nox-Crete Products Group; MONOFILM.
l. Sika Corporation; [Caltexol CIMFILM] [SikaFilm].
m. SpecChem, LLC; Spec Film.
n. TK Products; TK-2120 TRI-FILM.
o. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.
p. W. R. Meadows, Inc; EVAPRE.
q. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
D. Water: Potable.
E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
a. Anti-Hydro International, Inc; A-H Curing Compound #2 DR WB.
b. BASF Corporation; Construction Systems; [MasterKure CC 160 WB (Pre-2014: Kure N Seal WB)] [MasterKure CC 180 WB (Pre-2014: Kure N Seal VOC)] [MasterKure CC 200 WB (Pre-2014: Kure N Seal W)].
c. ChemMasters, Inc; Safe-Cure Clear DR.
d. Dayton Superior; [Clear Cure VOC J7WB] [Clear Resin Cure J11W].
e. Euclid Chemical Company (The); an RPM company; [Aqua-Cure VOX] [Diamond Clear VOX] [Kurez DR VOX].
f. Kaufman Products, Inc; [DR Cure] [Thinfilm 420].
g. L&M Construction Chemicals, Inc; L&M CURE R.
h. Lambert Corporation; AQUA KURE - CLEAR.
i. Nox-Crete Products Group; [Res-Cure DH] [Res-Cure DS] [Resin Cure E].
j. Right Pointe; Clear Water Resin.
k. SpecChem, LLC; [PaveCure Rez] [SpecRez].
l. TK Products; TK-2519 DC WB.
m. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.
n. W. R. Meadows, Inc; 1100-CLEAR SERIES.
o. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
a. AWRC Corporation; [AMERI-SHIELD Shield-Sheen WB 25] [AMERI-SHIELD Shield-Sheen WB 30].
b. BASF Corporation; Construction Systems; <Insert product designation>.
c. ChemMasters, Inc; Polyseal WB.
d. Dayton Superior; [Cure & Seal 1315 EF] [Cure & Seal 1315 J22WB].
e. Euclid Chemical Company (The); an RPM company; Super Diamond Clear VOX.
f. Kaufman Products, Inc; [Krystal 25 Emulsion] [Krystal 25 OTC].
g. L&M Construction Chemicals, Inc; Lumiseal WB Plus.
h. Lambert Corporation; UV Safe Seal.
i. Metalcrete Industries; Metcure 30.
j. Right Pointe; Right Sheen WB30.

k. SpecChem, LLC; Cure & Seal WB 25.
l. TK Products; Bright Kure & Seal 1315 VOC.
m. Vexcon Chemicals Inc.; Vexcon Starseal 1315.
n. W. R. Meadows, Inc; Vocomp-30.
o. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-re-dispersible, acrylic emulsion or styrene butadiene.
D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
E. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034-inch-thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than [4100 psi] at 28 days when tested according to ASTM C 109/C 109M.
B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.
   2. Slag Cement: 25 percent.
   3. Silica Fume: 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
   4. Use shrinkage reducing admixture (SRA) in concrete, as required, to meet shrinkage requireements.
   5. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.50.
   3. Slump Limit: 5 inches, or 8 inches for concrete with verified slump of 3 to 5 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
B. Foundation Walls: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.40.
   3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
   4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
   5. Shrinkage Requirement: Concrete shall be proportioned such that the results of shrinkage test as defined in section 1.8.B of this specification do not exceed 0.030 % at 28 days of drying for laboratory cast specimens.
C. Slabs-on-Grade: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.40.
   3. Minimum Cementitious Materials Content: 520 lb/cu. yd.
   4. Slump Limit: 5 inches, plus or minus 1 inch.
   5. Air Content: 7.5 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
   6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
   7. Shrinkage Requirement: Concrete shall be proportioned such that the results of shrinkage test as defined in section 1.8.B of this specification do not exceed 0.030 % at 28 days of drying for laboratory cast specimens.
   8. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 5 lb/cu. yd.
D. Suspended Slabs and Beams: Normal-weight concrete.
   1. Minimum Compressive Strength: As indicated at 28 days.
   2. Maximum W/C Ratio: 0.40.
   3. Minimum Cementitious Materials Content: 540 lb/cu. yd.
   4. Minimum 20% Fly Ash
   5. Minimum 25% Slag Cement
   6. Slump Limit: 5 inches, plus or minus 1 inch.
   7. Air Content: 7.5 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
   8. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
   9. Shrinkage Requirement: Concrete shall be proportioned such that the results of shrinkage test as defined in section 1.8.B of this specification do not exceed 0.030 % at 28 days of drying for laboratory cast specimens.
   10. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 5 lb/cu. yd.
E. Concrete Toppings, curbs, and equipment pads: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.

F. Columns: Normal-weight concrete.
1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.40.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

G. Shear Walls and Link Beams: Normal-weight concrete.
1. Minimum Compressive Strength: As indicated at 28 days.
2. Maximum W/C Ratio: 0.40.
3. Slump Limit: 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

2.15 FABRICATING REINFORCEMENT

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

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M [and ASTM C 1116/C 1116M] and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 – EXECUTION

3.1 FORMWORK INSTALLATION

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

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces, at Grid 1.5 and 11.5 shear walls at exposed surfaces of elevator entries.
2. Class B, 1/4 inch for formed surfaces exposed to view.
3. Class C, 1/2 inch for rough-formed finished surfaces not exposed to view.

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

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
H. Chamfer exterior corners and edges of permanently exposed concrete.
I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

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

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

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

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
F. Reinforcing shall be epoxy coated and shall conform to the standards of ASTM A775 in any location where the reinforcing and/or reinforced system have the potential to come in contact with corrosive and/or damaging environmental elements. These areas include, but are not limited to the following:
   1. All locations.
G. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.7 680 3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, 696 sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
   2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
   3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

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

3.8 WATERSTOP INSTALLATION

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

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

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed. Examine conditions of substrates and other conditions under which work is to be performed and notify Owner, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view/touch at Grid 1.5 and 11.5 shear walls at exposed surfaces of elevator entries.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
   1. Apply scratch finish to surfaces indicated and to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for slabs.

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

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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

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

C. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive 815 Strength: 4000 psi at 28 days.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Concrete Stairs: Provide stairs with concrete treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

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

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods. Concrete shall be wet cured for seven days as a minimum requirement:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

2. Do not apply to concrete that is less than 14 days old.
3. Apply liquid until surface is saturated, scrubbing into surface until 874 a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.15 JOINT FILLING

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

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Structural Engineer’s and Architect's approval.
B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard Portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   2. After concrete has cured at least 14 days, correct high areas by grinding.
   3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as

original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, 933 using epoxy adhesive and patching mortar.

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

3.17 FIELD QUALITY CONTROL

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

B. Inspections:

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

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

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.
   a. For concrete with a specified minimum compressive strength of 6,000 psi or less, cast and laboratory cure one set of five standard cylinder specimens for each composite sample.
   b. For concrete with a specified minimum compressive strength greater than 6,000 psi, cast and laboratory cure one set of seven standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39/C 39M; test laboratory-cured specimens as follows:
   a. For concrete with a specified minimum compressive strength of 6,000 psi or less, test one laboratory-cured specimen at 7 days and one set of two specimens at 28 days, utilizing the remaining two specimens as reserves.
   b. For concrete with a specified minimum compressive strength greater than 6,000 psi, test one laboratory-cured specimen at 7 days, one set of two specimens at 28 days, and one set of two specimens at 56 days, utilizing the remaining two specimens as reserves.
   c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive strength test value falls below specified compressive strength by more than 500 psi.
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/994 C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

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

B. Protect completed work from damage and construction operations throughout finishing and curing operations.

END OF SECTION

SECTION 03 38 16
UNBONDED POST-TENSIONED CONCRETE

GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Post-tensioning reinforcement and accessories including prestressing tendons, pocket formers, support bars, bar chairs, and slab bolsters.
2. Post-tensioning operations including stressing, recording tendon elongations and gage pressures, and finishing tendons.

1.3 DEFINITIONS

A. Strand Tail: Excess strand length extending past the anchorage device.
B. Stressing Pocket: Void formed by pocket former at stressing-end anchorage to provide required cover over wedges and strand tail.
C. Wedge Cavity: Cone-shaped hole in anchorage device designed to hold the wedges that anchor the strand.

1.4 COORDINATION

A. Attachments and Penetrations:
1. Attach permanent construction such as curtain-wall systems, handrails, fire-protection equipment, lights, and security devices to the post-tensioned slab using embedded anchors.

2. Drilled anchors, power-driven fasteners, and core drilling for sleeves or other penetrations are not allowed unless authorized in writing by Architect.
3. Form penetrations within 18 inches of an anchorage with ASTM A 53/A 53M, Schedule 40 steel pipe.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to installation and stressing of post-tensioning tendons including, but not limited to, the following:
a. Construction schedule and availability of materials, personnel, and equipment needed to make progress and avoid delays.
b. Storage of post-tensioning materials on-site.
c. Structural load limitations.
d. Coordination of post-tensioning installation drawings and nonprestressed reinforcing steel placing drawings.
e. Coordination of reinforcement drawings and Contractor-prepared slab penetration drawings.
f. Horizontal and vertical tolerances on tendons and nonprestressed reinforcement placement.
g. Marking and measuring of elongations.
h. Submittal of stressing records and requirements for tendon finishing.
i. Removal of formwork.

1.6 ACTION SUBMITTALS

A. Product Data: For the following:
1. Post-tensioning coating.
2. Tendon sheathing.
3. Anchorage devices.
4. Tendon couplers.
5. Bar and tendon supports.
6. Pocket formers.
7. Sheathing repair tape.
8. Stressing-pocket patching material.
9. Encapsulation system.

B. Shop Drawings: Include the following, prepared by or under the supervision of a qualified professional engineer, detailing tendon layout and installation procedures:
1. Installation drawings including plans, elevations, sections, and details.
2. Numbers, arrangement, and designation of post-tensioning tendons.
3. Tendon profiles and method of tendon support including chair heights and locations. Show tendon profiles at sufficient scale to clearly indicate all support points, with their associated heights.
4. Tendon anchorage details including bundled tendon flaring.
5. Tendon clearances around slab openings and penetrations.
6. Construction joint locations, pour sequence, locations of anchorages and blockouts required for stressing.
7. Stressing procedures and jacking force to result in final effective forces used in determining number of tendons required.
8. Calculated elongations for each tendon.
9. Details for horizontal curvature around openings and at anchorages.
10. Details for corners and other locations where tendon layouts may conflict with one another or nonprestressed reinforcing steel.
11. Locations of nonprestressed reinforcement required for installing post-tensioning tendons including, but not limited to, the following:
a. Support bars.
b. Backup bars and hairpins at anchorages.
c. Hairpins at locations of horizontal curvature.
d. Supplemental reinforcement at blockouts.

C. Delegated-Design Submittal: For post-tensioning system.

1. Sealed design calculations prepared by a licensed structural engineer in the state of Wisconsin, indicating method of elongation calculation including values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, and shrinkage.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include resume of individual supervising installation and stressing of post-tensioning tendons.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
C. Product Certificates:
   1. For each type of anchorage device and coupler.
   2. For each type of encapsulation system.
D. Mill Test Reports: Certified mill test reports for prestressing strand used on Project indicating that strand is low relaxation and including the following:
   1. Coil numbers or identification.
   2. Breaking load.
   3. Load at 1 percent extension.
   4. Elongation at failure.
   5. Modulus of elasticity.
   6. Diameter and net area of strand.
E. Field quality-control reports.
F. Procedures Statement: Procedures for cutting excess strand tail and patching stressing pocket.
G. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.
H. Stressing Records: Submit the same day as stressing operations.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Fabricating plant certified by PTI according to procedures set forth in PTI's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."
B. Installer Qualifications: A qualified installer whose full-time Project superintendent has successfully completed PTI's Level 1 - Field Fundamentals course or has equivalent verifiable experience and knowledge acceptable to Architect.
   1. Superintendent must receive training from post-tensioning supplier in the operation of stressing equipment to be used on Project.
C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
   1. Testing Agency Inspector: Personnel performing field inspections and measuring elongations shall have successfully completed PTI's Level 1 - Field Fundamentals course or shall have equivalent verifiable experience and knowledge acceptable to Architect.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle post-tensioning materials according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
B. Immediately remove damaged components from Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain post-tensioning materials and equipment from single source.
   1. Stressing jacks not provided by post-tensioning supplier must be calibrated and approved for use on Project by post-tensioning supplier.

2.2 PRESTRESSING TENDONS

A. ACI Publications: Comply with ACI 423.6, "Specification for Unbonded Single Strand Tendons," unless otherwise indicated in the Contract Documents.
B. Prestressing Strand: ASTM A 416/A 416M, Grade 270, uncoated, seven-wire, low-relaxation, 0.5-inch-diameter strand.
C. Post-Tensioning Coating: Compound with friction-reducing, moisture-displacing, and corrosion-inhibiting properties; chemically stable and nonreactive with prestressing steel, nonprestressed reinforcement, sheathing material, and concrete.
   1. Minimum Coating Weight: 2.5 lb for 0.5-inch-diameter strand per 100 feet of strand.
   2. Completely fill annular space between strand and sheathing over entire tendon length with post-tensioning coating.
D. Tendon Sheathing:
   1. Minimum Thickness: 0.050 inch for polyethylene or polypropylene with a minimum density of 0.034 lb/cu. in.
   2. Continuous over length of tendon to provide watertight encapsulation of strand.
E. Anchorage Device and Coupler Assembly: Assembly of strand, wedges, and anchorage device or coupler complying with static and fatigue testing requirements and capable of developing 95 percent of actual breaking strength of strand.
   1. Anchorage Bearing Stresses: Comply with ACI 423.6 for stresses at transfer load and service load.
   2. Fixed-End Anchorage Device Assemblies: Plant fabricated with wedges seated at a load of not less than 80 percent and not more than 85 percent of breaking strength of strand.
F. Encapsulation System: Watertight encapsulation of prestressing strand consisting of the following:
   1. Wedge-Cavity Caps: Attached to anchorages with a positive mechanical connection and completely filled with post-tensioning coating.
      a. Caps for Fixed- and Stressing-End Anchorage Devices: Designed to provide watertight encapsulation of wedge cavity. Sized to allow required extension of strand past the wedges.
         1) Attach cap for fixed-end anchorage device in fabricating plant.
      b. Caps at Intermediate Anchorages: Open to allow passage of strand.
   2. Sleeves: Attached to anchorage device with positive mechanical connection; overlapped a minimum of 4 inches with sheathing and completely filled with post-tensioning coating.

2.3 NONPRESTRESSED STEEL BARS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content a minimum of 25 percent.
B. Support Bars, Reinforcing Bars, Hairpins:
   1. Epoxy-Coated Steel: ASTM A 615, Grade 60, deformed bars,ASTM A 775 epoxy coated with less than 2 percent damaged coating in each 12-inch bar length.
      a. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on bars and complying with ASTM A 775/A 755M. Repair damaged areas according to ASTM D 3963/D 3963M.
C. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons and tendon support bars in place. Manufacture bar supports, according to CRSI's "Manual of Standard Practice," from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
   1. For epoxy-coated bars, use CRSI Class 1A epoxy-coated bar supports.

2.4 ACCESSORIES

A. Pocket Formers: Capable of completely sealing wedge cavity; sized to provide the required cover over the anchorage and allow access for cutting strand tail.
B. Anchorage Fasteners: Galvanized -steel nails, wires, and screws used to attach anchorage devices to formwork.
C. Sheathing Repair Tape: Elastic, self-adhesive, moistureproof tape with minimum width of 2 inches, in contrasting color to tendon sheathing; nonreactive with sheathing, coating, or prestressing steel.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Adhesive Tape Products, Ltd.; PWT-20.
      b. Covalence Adhesives; Polyken 826.

c. 3M; Tape 226.

2.5 PATCHING MATERIAL

A. One-component, polymer-modified, premixed patching material containing selected silica aggregates and portland cement, suitable for vertical and overhead applications. Do not use material containing chlorides or other chemicals known to be deleterious to prestressing steel or material that is reactive with prestressing steel, anchorage device material, or concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Construction Chemicals, LLC - Building Systems; Emaco R350 CI.
   b. Euclid Chemical Company (The); Verticoat Supreme.
   c. Fox Industries, Inc.; FX-228.
   d. Kaufman Products, Inc.; Patchwell Kit V/O.
   e. Sika Corporation, Inc.; SikaMonoTop 611.

PART 3 - EXECUTION

3.1 FORMWORK

A. Provide formwork for post-tensioned elements as specified Section 03 30 00 "Cast-in-Place Concrete." Design formwork to support load redistribution that may occur during stressing operation. Ensure that formwork does not restrain elastic shortening, camber, or deflection resulting from application of prestressing force.

B. Do not remove forms supporting post-tensioned elements until tendons have been fully stressed and elongations have been approved by Architect.

C. Do not place concrete in supported floors until tendons on supporting floors have been stressed and elongations have been approved by Architect.

3.2 NONPRESTRESSED STEEL REINFORCEMENT PLACEMENT

A. Placement of nonprestressed steel reinforcement is specified in Section 03 30 00 "Cast-in-Place Concrete." Coordinate placement of nonprestressed steel reinforcement with installation of post-tensioning tendons.

3.3 TENDON INSTALLATION

A. Install tendons according to installation drawings and procedures stated in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."

1. Tolerances: Comply with tolerances in ACI 423.6 for beams and slabs.

B. Tendon Supports: Provide continuous slab bolsters or bars supported on individual high chairs spaced at a maximum of 42 inches o.c. to ensure tendons remain in their designated positions during construction operations and concrete placement.

1. Support tendons as required to provide profiles shown on installation drawings. Position supports at high and low points and at intervals not exceeding 48 inches. Ensure that tendon profiles between high and low points are smooth parabolic curves.
2. Attach tendons to supporting chairs and reinforcement without damaging tendon sheathing.
3. Support slab tendons independent of beam reinforcement.

C. Maintain tendon profile within maximum allowable deviations from design profile as follows:

1. 1/8 inch for member depth less than or equal to 8 inches.
2. 3/8 inch for member depth greater than 8 inches and less than or equal to 24 inches.
3. 1/2 inch for member depth greater than 24 inches.

D. Maintain minimum radius of curvature of 480-strand diameters for lateral deviations to avoid openings, ducts, and embedded items. Maintain a minimum of 2 inches of separation between tendons at locations of curvature.

E. Limit tendon bundles to five tendons. Do not twist or entwine tendons within a bundle. Maintain a minimum distance of 12 inches between centers of adjacent bundles.

F. If tendon locations conflict with nonprestressed reinforcement or embedded items, tendon placement governs. Obtain Architect's approval before relocating tendons or tendon anchorages that interfere with one another.
G. Deviations in horizontal spacing and location of slab tendons are permitted when required to avoid openings and inserts.
H. Installation of Anchorage Devices:
1. Place anchorage devices at locations shown on approved installation drawings.
2. Do not switch fixed- and stressing-end anchorage locations.
3. Attach pocket formers, intermediate anchorage devices, and stressing-end anchorage devices securely to bulkhead forms. Install stressing-end and intermediate anchorage devices perpendicular to tendon axis.
4. Install tendons straight, without vertical or horizontal curvature, for a minimum of 12 inches behind stressing-end and intermediate anchorages.
5. Embed intermediate anchorage devices at construction joints in first concrete placed at joint.
6. Minimum splice length in reinforcing bars at anchorages is 24 inches. Stagger splices a minimum of 60 inches.
7. Place fixed-end anchorage devices in formwork at locations shown on installation drawings. Support anchorages firmly to avoid movement during concrete placement.
8. Remove loose caps on fixed-end anchorages, refill with post-tensioning coating, and re-attach caps to achieve a watertight enclosure.
I. Maintain minimum concrete cover as follows:
1. From Exterior Edge of Concrete to Wedge Cavity: 1-1/2 inches.
2. From Exterior Edge of Concrete to Strand Tail: 3/4 inch.
3. From Exterior Edge of Concrete to Wedge-Cavity Cap: 1 inch.
4. Top, Bottom, and Edge Cover for Anchorage Devices: 3/4 inch.
J. Maintain minimum clearance of 6 inches between tendons and openings.
K. Prior to concrete placement, mark tendon locations on formwork with spray paint.
L. Do not install sleeves within 36 inches of anchorages after tendon layout has been inspected.
M. Do not install conduit, pipe, or embeds requiring movement of tendons after tendon layout has been inspected.
N. Do not use couplers unless location has been approved by Architect.

3.4 SHEATHING INSPECTION AND REPAIR

A. Inspect sheathing for damage after installing tendons. Repair damaged areas by restoring post-tensioning coating and repairing or replacing tendon sheathing.
1. Ensure that sheathing is watertight and there are no air voids.
2. Follow tape repair procedures in PTI's "Field Procedures Manual for Unbonded Single Strand Tendons."
B. Maximum length of exposed strand behind anchorages is as follows:
1. Fixed End: 12 inches.
2. Intermediate and Stressing End: 1 inch.
a. Cover exposed strand with encapsulation sleeve to prevent contact with concrete.
C. Immediately remove and replace tendons that have damaged strand.

3.5 CONCRETE PLACEMENT

A. Do not place concrete until placement of tendons and nonprestressed-steel reinforcement has been inspected by special inspector of testing agency.
B. Provide Architect and testing agency a minimum of 48 hours' notice before concrete placement.
C. Place concrete as specified in Section 03 30 00 "Cast-in-Place Concrete." Ensure compaction of concrete around anchorages.
D. Ensure that position of tendon and nonprestressed-steel reinforcement does not change during concrete placement. Reposition tendons and nonprestressed-steel reinforcement moved during concrete placement to original location.
E. Ensure that method of concrete placement does not damage tendon sheathing. Do not support pump lines, chutes, or other concrete-placing equipment on tendons.

3.6 TENDON STRESSING

A. Calibrate stressing jacks and gages at start of project and at least every six months thereafter. Keep copies of calibration certificates for each jack-and-gage pair on Project site that are available for inspection. Exercise care in handling stressing equipment to ensure that proper calibration is maintained.
B. Stress tendons only under supervision of a qualified post-tensioning superintendent.
C. Do not begin stressing operations until concrete strength has reached 3000 psi as indicated by compression tests of field-cured cylinders.
D. Complete stressing within 96 hours of concrete placement.
E. If concrete has not reached required strength, obtain Architect's approval to partially stress tendons and delay final stressing until concrete has reached required strength.
F. Stage stress transfer girders according to schedule shown on the Contract Drawings.
G. If detensioning and restressing of tendon is required, discard wedges used in original stressing and provide new wedges.
H. Mark and measure elongations according to PTI's "Field Procedures Manual for Unbonded Single Strand Tendons." Measure elongations to closest 1/8 inch.
I. Submit stressing records within one day of completion of stressing. If discrepancies between measured and calculated elongations exceed plus or minus 7 percent, resolve these discrepancies to satisfaction of Architect.
J. Prestressing will be considered acceptable if gage pressures shown on stressing record correspond to required stressing force and calculated and measured elongations agree within 7 percent.
K. If measured elongations deviate from calculated elongations by more than 7 percent, additional testing, restressing, strengthening, or replacing of affected elements may be required.
L. Stressing Records: Testing agency shall record the following information during stressing operations:
    1. Name of Project.
    2. Date of approved installation drawings used for installation and stressing.
    3. Floor number and concrete placement area.
    4. Date of stressing operation.
    5. Weather conditions including temperature and rainfall.
    6. Name and signature of inspector.
    7. Name of individual in charge of stressing operation.
    8. Serial or identification numbers of jack and gage.
    9. Date of jack-and-gage calibration certificates.
    10. Gage pressure to achieve required stressing force per supplied calibration chart.
    11. Tendon identification mark.
    12. Calculated tendon elongation.
    13. Actual tendon elongation.
    14. Actual gage pressure.

3.7 TENDON FINISHING

A. Do not cut strand tails or cover anchorages until stressing records have been reviewed and approved by Architect.
B. Cut strand tails as soon as possible after approval of elongations.
C. Cut strand tail between 1/2 and 3/4 inch from wedges. Do not damage tendon or concrete during removal of strand tail. Acceptable methods of cutting strand tail include the following:
    1. Oxyacetylene flame.
    2. Abrasive wheel.
    3. Hydraulic shears.
    4. Plasma cutting.
D. Install caps and sleeves on intermediate anchorages within one day of stressing.
E. Cut strand tails and install caps on stressing-end anchorages within one day of Architect's acceptance of elongations.
F. Patch stressing pockets within one day of cutting strand tail. Clean inside surface of pocket to remove laitance or post-tensioning coating before installing patch material. Finish patch material flush with adjacent concrete.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Before concrete placement, special inspector will inspect the following for compliance with post-tensioning installation drawings and the Contract Documents:
      a. Location and number of tendons.
      b. Tendon profiles and cover.
      c. Installation of backup bars, hairpins, and other nonprestressed reinforcement shown on post-tensioning installation drawings.
      d. Installation of pocket formers and anchorage devices.
      e. Repair of damaged sheathing.
      f. Connections between sheathing and anchorage devices.
   2. Special inspector will record tendon elongations during stressing.
   3. Special inspector will immediately report deviations from the Contract Documents to Architect.
B. Prepare test and inspection reports.

3.9 PROTECTION

A. Do not expose tendons to electric ground currents, welding sparks, or temperatures that would degrade components.
B. Protect exposed components within one workday of their exposure during installation.
C. Prevent water from entering tendons during installation and stressing.
D. Provide weather protection to stressing-end anchorages if strand tails are not cut within 10 days of stressing the tendons.

3.10 REPAIRS

A. Submit repair procedure to Architect for evaluation and approval.
B. Do not proceed with repairs requiring removal of concrete unless authorized in writing by Architect.

END OF SECTION

SECTION 03 45 19

ARCHITECTURAL PRECAST CONCRETE FABRICATIONS

PART 1 – GENERAL

1.1 SUMMARY

A. Architectural precast concrete fabrications and associated items as shown on the Drawings and specified herein, including but not necessarily limited to the following:
   1. Fabrication, shipping and erection of architectural precast concrete fabrications:
      a. Parapets
      b. Planter walls
      c. Other fabrications shown or noted on the Drawings as Architectural Precast Concrete.
   2. Providing and installing support, anchors and required accessories for attachment to the building or supporting structure.
   3. Structural design of the above.
   4. Grouting and sealing of joints.

B. Related Sections:
   1. Sealants: Section 079200.

1.2 PERFORMANCE REQUIREMENTS

A. The structural design and engineering of each precast concrete unit including reinforcing, embedments, inserts, connections, anchors and welds is the undivided the responsibility of the Precast Concrete Fabrication Manufacturer.

B. Anchors and Connections:
   1. Steel connections and assemblies connecting the precast units to the supporting structure are shown as suggested locations for the precast manufacturer's benefit. The precast manufacturer is responsible for engineering and providing the connections and anchors, including all connecting hardware and reinforcing necessary for fabrication, transportation and erection.
   2. Notify the Architect in writing prior to the submittal of shop drawings of any changes in the proposed locations of connections.

3. The Architect's review of shop drawings is not to be construed as removing responsibility from the precast manufacturer for structural failures related to design, fabrication, transportation, erection and fabrication service.

C. Design precast units and associated construction of the installation to meet or exceed the following:
1. Wind load: 25 lbs/sf.
2. Erection and dead loads for size units shown on the Drawings.
3. Implied loads from other construction.
4. Loads caused by temperature stresses, erection stresses and unit service as applicable.

D. Submit structural design, and engineering calculations for the above prepared by, signed and sealed by a structural engineer licensed in the State of Wisconsin.

1.3 QUALITY ASSURANCE

A. Provide architectural precast concrete fabrications and associated items of the installation complying with all local building codes, ordinances, rules and regulations of governmental and public authorities having jurisdiction over this work and are to conform to dead load factors relative to the fabrications.

B. Provide architectural precast concrete fabrications and associated items of the installation, by a firm having the undivided responsibility for the structural design and engineering, fabrication and installation except as otherwise specified herein.

C. Manufacturer Qualifications:
1. The precast manufacturer is to be a firm whose plant is PCI Certified (Group A1 -Architectural Products and AT-Architectural Trim) in the production of architectural precast concrete fabrications of the quality, scope and complexity shown on the Drawings and specified herein.
2. The manufacturer is to have experienced personnel, physical facilities and management capability to execute the work proposed.
3. The precast fabrication manufacturer is to submit to the Architect in writing evidence of certification and experience; including a current list of similar completed projects with references of Owners, Architect, Contractors and installation descriptions.

D. Provide design, fabrication and erection of the architectural precast fabrications and associated items of the installation conforming to the following:
1. American Concrete Institute: ACI 315, ACI 318, ACI 347, ACI 533.3R, and ACI 533.4R
2. Prestressed Concrete Institute: PCI: MNL-116, MNL-117, MNL-120 and MNL-127.
3. American Welding Society: AWS D1.1 and AWS D12.1

E. Provide welding procedures, including the qualification of welders, in accordance with AWS, Code for Welding in Building Construction D1.10, current edition.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 013323:
1. Manufacturer’s Literature: Materials description and installation instructions for manufactured items used in the fabrication including sealants and special coatings.
2. Manufacturer's Data:
   a. Submit three (3) copies of erection procedures description.
   b. Mix Designs: Submit 3 copies as specified in Article 2.03. Mix designs will not be reviewed but are submitted for record purposes only, field performance of the mix is the responsibility of the supplier.
3. Certification: Submit 3 copies of the following:
   a. Certification of conformance with the quality assurance standards for materials used and fabrication and erection procedures specified herein, signed by the Precast Concrete Manufacturer and Erector.
   b. Welders Certification.
4. Test Reports: Submit three (3) copies, concrete mix design or designs and production tests my manufacturer.
5. Design Calculations:
   a. Submit calculations for fabrications and connections signed and sealed by a professional engineer, licensed in the State of Wisconsin.
   b. Cross referenced calculations to shop drawings.
   c. All calculations submitted to the Architect are for record purposes only and will not be reviewed.

6. Shop Drawings:
   a. Show complete layout of all fabrications, elevations and sections of each type of fabrication, fabrication dimensions, identification marks.
   b. Details of reinforcement, fabrication inserts, cast-in shapes, anchorage embedments, surface treatment, connections to supporting structure indicating all welds and accessories.
   c. Show adjacent construction, support framing and their relationship to the fabrications and connections.
   d. Indicate vertical and horizontal reactions to the structure at all load transfer points.
   e. Show details of all sealant joints, indicate materials used in joint.
   f. Include erection procedure for precast units, sequence of erection, and required handling equipment. Indicate that copy of each instruction has been transmitted to the Erector.
   g. Provide shop drawings signed and sealed by the same licensed Professional Engineer as prepared and signed the structural calculations.
7. Finish Samples: Three (3) 24 inches x 24 inches x 2 inches thick samples of proposed fabrication showing representation of materials, finishes, cast-in features and reveals, colors and finish surface texture. Submit three (3) samples showing a range of color and texture for Architect's review prior to the start of production, match Architect's sample.
8. Warranties:
   a. Three (3) signed copies of sealant installation warranty.

1.5 TESTING SERVICES

A. The Contractor’s Testing Laboratory will be responsible for conducting and interpreting tests, state in each report whether or not the test specimens conform to all requirements of the Contract Document and specifically note any deviation therefrom.

B. General requirements for testing are specified in Section 014000. Specific test and inspection requirements are specified herein.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Lift and support precast concrete units during manufacturing, storage, transportation and erection operations only at the lifting or supporting points, or both, as shown on the Shop Drawings and marked on each unit. Provide blocking, clean and non-staining. Provide lateral support sufficient to prevent excessive bowing and warping. Adequately protect edges of the units with padding or other means to prevent staining, chipping or spalling of the concrete.

B. Store and protect units to prevent contact with soil, staining and physical damage. Store units on firm level, and smooth surface. Place stored units so that identification marks are visible.

1.7 PROJECT CONDITIONS

A. Examine all parts of supporting structure and conditions under which precast concrete work is to be erected and notify the Contractor and Architect in writing of conditions detrimental to proper and timely completion of the work. The Contractor is to correct or repair conditions that effect the proper installation of the precast fabrications. Do not proceed with installation until unsatisfactory conditions have been corrected. Installation of precast concrete units and associated items the installation constitutes acceptance of the existing conditions.

B. Verify dimensions of supporting structures at the project site and adjust final shop drawings to reflect actual field dimensions.

C. Design modifications may be made only as necessary to meet field conditions and to ensure proper fitting of the work, and only when approved in writing by the Architect. Maintain the design concept as shown on the Drawings without increasing or decreasing sizes of members, varying joint widths, or altering profiles and alignment of units.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Portland Cement ASTM C 150, Type I, white.
B. Air Entraining Agent: ASTM C 260.
C. Aggregate for Normal Weight Concrete: ASTM C 33.
   1. Coarse Aggregate: As required to match Architect's sample.
   2. Fine Aggregate: As required to match Architect's sample.
D. Water Reducing Admixture: ASTM C 494, containing no chlorides, fluorides or nitrates.
E. Color Agents: Synthetic and natural inorganic iron oxides and pigments which are inert, stable to atmospheric conditions, sunfast (fade proof) weather resistant, alkali resistant, lime proof, compounded for use in precast concrete and which are neither corrosive nor expansive. Color as required to produce concrete matching the Architect selected sample.
F. Water: Clear, clean, free of deleterious matter that would interfere with the color, setting or strength of concrete.
G. Reinforcing Bars: ASTM A 615, Grade 60.
H. Welded Wire Fabric: ASTM A 185.
I. Structural Steel: ASTM A 36, galvanized after fabrication.
J. Embedded Steel Anchors: ASTM A 306, Grade 65, galvanized after fabrication.
K. Stainless Steel: ASTM A 666, Type 304, Grade B.
L. Carbon Steel Plate: ASTM A 283, Grade B, galvanized after fabrication.
M. Standard Bolts and Nuts: ASTM A 307, Grade A, galvanized.
N. High-Strength Bolts and Nuts: ASTM A 325-F, galvanized.
O. Welding Electrodes: AWS Specifications, Serial Designation E-60 or E-70, compatible with metal being welded.
P. Galvanize products as shown or specified in accordance with ASTM A 123 and A 385 as applicable.
Q. Shop Coat Primer Paint: Modified alkyd rust-inhibiting primer paint, one of the following:
   1. Series 10-1009, Tnemec, Company, Inc.
   2. V13-R-78, The Valspar Corporation.
   3. M12, Benjamin Moore & Co.
   4. GP-818, Carboline Company.
R. Bituminous Paint: Asphalt emulsion, ASTM D 1187.
S. Galvanized Primer: Complying with FS TT-P-641F.
T. Grout: Non-shrink, non-metallic, pre-mixed, non-corrosive, non-staining product containing select silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, one of the following:
   1. Master Flow 713, Master Builders.
   2. SonoGrout, Sonneborn Building Products.
   3. Five Star Grout, U.S. Grout Corporation.
U. Bearing Pads: Chloroprene (neoprene): Conforming to Division II, Section 25 of AASHTO Standard Specification for Highway Bridges.
V. Sealants and Joint Fillers: Refer to Section 079200, Sealants.

2.2 PROPORTION AND DESIGN OF CONCRETE MIX

A. Proportioned cement aggregates and water to produce a concrete which will attain a minimum test cylinder strength of 5,000 psi at 28 days. Mix designs are subject to the Architect's review.
B. Provide mix designs established by tests on trial batches to achieve the required strength. Provide mix designs and tests performed by an Independent Testing Laboratory approved by the Architect. Provide tests performed on both facing and back-up mixes. Submit triplicate copies of mix designs and test results to the Architect.
C. Provide lightweight concrete, if used as backing for fabrications, weighing not more than 110 lbs/cu ft dry. Do not use lightweight aggregate for exposed surfaces.
D. Mix concrete conforming with NRMCA Bulletin No. 44, Control of Quality of Ready-Mixed Concrete.
E. Mix Properties:
   1. Produce standard-weight concrete consisting of the specified portland cement, aggregates, admixtures, and water to produce the following properties:
      a. Compressive strength: 5,000 psi minimum at 28 days.
      b. Maximum aggregate size: 1/2 inch.

c. Slump at point of discharge: 3-1/2 inches.
d. Total air content: Not less than 4 percent or more than 6 percent.
e. Water-cement ratio, minimum (not over 5 gallons/sack of cement).
f. Water absorption, maximum of 4 percent when tested, according to ACI 704.

2. Submit written reports to the Architect of proposed mix for concrete at least 15 days prior to start of precast unit production. Do not begin concrete production until mixes and evaluations have been reviewed by the Architect and finish samples have been approved.
3. Adjustment to Concrete Mixes: Mix design adjustments may be required when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to the Architect for review before using in the work.

2.3 FABRICATION

A. Cast fabrications in smooth molds of rigid construction with maintenance of dimensions stated below. Provide molds accurate in detail to the shapes shown on the Drawings and the final reviewed Shop Drawings with sharp corners and arises so as to assure excellence in the finished product. Fabricate precast structural concrete fabrications to comply with the following fabricated dimensional tolerances:
   1. Length: Plus 1/8 inch or minus 1/4 inch.
   2. Width: Plus 1/8 inch or minus 1/4 inch.
   3. Depth: Plus 1/4 inch or minus 1/8 inch.
   4. Position of handling devices: Plus or minus 3 inches.
   5. Position of weld plates: Plus or minus 3/8 inch of indicated centerline.
   6. Squareness of ends (vertical and horizontal alignment): Plus or minus 1/4 inch.
   7. Warpage: 1/8 inch per 6 feet length of fabrication.
   8. Bowing: Concave or convex, of any part of a flat surface not to exceed the length of the bow/360, with a maximum of 3/4 inch in 30 feet.
   9. Squareness: not more than 1/8 inch per 6 feet out of square as measured on the diagonal.
   10. Blockouts and reinforcements: within 1/4 inch of the indicated position to meet structural and cover requirements; otherwise within plus or minus ½ inch.
   11. Tolerances on any dimension not otherwise indicated: the numerically greater of plus or minus 1/16 inch per 10 feet or plus or minus 1/8 inch.
   12. Location of openings: plus or minus 1/4 inch, except plus or minus 1/8 inch for windows and door frames.

B. Precast units having dimensions greater or less than required will be rejected if the appearance or function of the structure is adversely affected, or if the larger dimensions interfere with other construction. Repair, or remove and replace rejected units as required to meet the construction conditions.

C. Provide reinforcement protection of a minimum of 3/4 inch. Take precautions to keep all reinforcing steel in the proper location during placement and consolidation of the concrete to insure that no staining or bleeding will occur from reinforcing steel being too close to the form surface. Provide accessories used to support reinforcing steel which are in contact with exposed surfaces of stainless steel or other non-staining material.

D. Initial curing, including heat and/or moisture, if needed to obtain adequate stripping strengths, must be carefully controlled and related to the setting curve of the cement. Cure units using plant proven methods and time periods (not less than 48 hours) which will produce consistent units of the specified strength, with the approved sample finish, free of shrinkage cracks, surface blemishes and irregularities. When hot weather conditions will cause loss of surface moisture from the fabrications keep humid for 5 days after removal from the forms using water which is pure and non-staining. When weather conditions can be expected to affect the general quality of the units, if exposed after removal from the forms, kept in the plant for 2 days.

E. Mark each fabrication to correspond with designation on the Shop Drawings. Imprint date of casting on each unit where it will not be exposed to view. Support fabrications during storage, handling and erection in such a way as to minimize warpage, cracking or staining. Lift and support fabrications only at designated locations.

F. Finish:
   1. Provide finishes free of voids, honeycomb, bug-holes, with true edges and surfaces. Surfaces with joint marks, chips, spalls, stains and other unsightly imperfections are not acceptable.

2. Obtain finish on exterior faces by washing off grout and light sand blasting to match the approved sample. Wood float inside faces and backs (not exposed to view) of fabrications.

G. Provide weld plates precast into fabrications in the shop. Provide necessary clip angles, seat angles, plates, shimming, and other accessories for insertion into or for attachment to the supporting structure as it is erected.
   1. Fabricate plates and angles cast into the fabrications or furnished for attachment to the structure or framing from structural steel, hot-dip galvanized after fabrication as specified herein unless noted or specified otherwise.
   2. Fabricate plates, angles and other such accessories cast into the fabrications or furnished for attachment to the structure or support framing where permanently exposed to the exterior or where noted on the Drawings of stainless steel as specified herein.

H. Provide concrete with 4 percent, +/- 1 percent, entrained air. Place concrete in a continuous operation to prevent the formation of seams or planes of weakness in precast units, complying with requirements of ACI 304. Thoroughly consolidate placed concrete in each precast unit by internal and external vibration without dislocation or damage to reinforcement and built-in items to produce a uniform dense concrete.

I. Before shipping to job, clean all exposed aggregate surfaces with a weak solution of muriatic acid and rinse with clean water as recommended by the manufacturer.

2.4 QUALITY CONTROL

A. The Testing Laboratory will evaluate precast concrete manufacturer's quality control and testing methods.

B. The Manufacturer is take test cylinders during production in a sufficient number to maintain close control over the uniform quality of the concrete, with at least four cylinders taken for every ten cubic yards. Preparation and curing of these test cylinders is to be identical with actual method of production of elements. The Manufacturer is to test the cylinders. The laboratory is to be open at all times to inspection by the Architect and the representative of the Contractor's Testing Laboratory.

C. Replace precast concrete units which do not conform to the specified requirements, including strength, tolerances, and finishes, with precast concrete units that meet the requirements of this section.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine all surfaces which are to receive the precast fabrications and accessories. Verify all dimensions and conditions of in-place and subsequent construction. Make adjustments and corrections to fabrications necessary to facilitate their installation and anchorage to the building structure. Maintain design concept of fabrications as shown on the Drawings and the final reviewed shop drawings without increasing or decreasing sizes or shapes of units without written approval of the Architect.

3.2 ERECTION

A. Provide necessary cranes to unload and perform all job site handling required to install the precast fabrications. Set each unit in the position to which it is assigned on the reviewed erection drawing and anchor securely to structural framework in accordance with the reviewed Shop Drawings. Carefully align and plumb all fabrications.

B. Provide temporary supports, bracing and guys as required to maintain position, stability and alignment of units as they are anchored to the supporting structure and until final connections have been made.

C. Install units with non-cumulative tolerances in accordance with MNL 117.

D. Set non-load bearing units dry without mortar, attaining joint dimensions shown on the Drawings with neoprene spacing and bearing pads. Set pads in joints positioned to the rear of the unit to prevent spalling of face surfaces.

E. Set units shown on the Drawings and load-bearing units in full bead of specified grout. Mix and install grout in accordance with the manufacturer's printed instructions. Set units on a full bed of grout supported on specified bearing pads. Do not apply loads or install units above until grout has hardened and cured. Rake back joint to a depth equal to the joint width for installation of joint sealant materials.

F. Where welding is used for connections perform by shielded electric arc method. Perform welding in accordance with AWS D1.0 and D12.1. Provide welding done by experienced welders, each of whom has passed the Standard Qualification Test of the American Welding Society within the last 12 months. Provide certification for each welder.

G. After erection of precast units touch up all welds, bolts, connections, and steel surfaces where shop paint has been abraded or improperly applied with the same paint specified for shop coat primer paint.

H. Remove and replace fabrications that are cracked, chipped, damaged or not meeting the standard of quality established by the Referenced Standards for Quality Assurance and the Architect's reviewed mock-up production sample. Replace such fabrications at no additional cost to the Owner.

I. Erect fabrications to the following location tolerances:
   1. Face width of joints: Plus or minus 3/16 inch.
   2. Joint Taper: 1/40 inch per foot length, with a maximum length of tapering in one direction of 10 feet.
   3. Step in face: 1/4 inch.
   4. Jog in alignment of edges: 1/4 inch.
   5. Alignment for exterior fabrications and units is the outside face.
   6. Variation from plumb: Plus or minus 1/2 inch in any 40 foot run.
   7. Variation from level: Plus or minus 1/2 inch in any 40 foot run.

3.3 SEALING JOINTS

A. Cleaned, primed and sealed joints between fabrications and at perimeters abutting adjoining construction where indicated to be sealed in accordance with the recommendations of the sealant manufacturer. Seal joints with two-part polyurethane sealant; refer to Section 07920, Sealants. Color of sealants will be selected by the Architect from manufacturer's standard colors with a maximum of 2 colors being utilized in the installation.

3.4 PATCHING

A. In the event field patching of precast units is required, as the result of chipping, spalling, cracking or other damage to the units, the Contractor shall submit to the Architect prior to patching, a detailed description of the proposed patching techniques and materials for each type of patching work to be used in the installation. Include manufacturer's literature and installation instructions for proposed materials to be used in the patching work.

B. After review of the materials and procedures, demonstrate patching techniques and materials in the field in locations directed by the Architect. After review by the Architect make required adjustments to materials and procedures as required to achieve satisfactory results as determined by the Architect's reviewed field tests. Document the accepted field test which will be use as a standard for judging the quality and workmanship of all subsequent patching work in the installation.

C. After review and acceptance of the patching techniques and materials proceed with patching at no additional cost to the Owner. Remove and replace any unit or component that can not be successfully patched in accordance with acceptable field test at no additional cost to the Owner.

3.5 CERTIFICATION OF WELDERS

A. Welding operators employed to execute welding, are to be previously qualified by test as prescribed in the American Welding Society's Standard Qualification Procedure or by such other tests as any governmental agencies having jurisdiction may prescribe. Provide welding made only by operators who are qualified to perform the type of work required, as evidenced by their passing the above prescribed tests. Tests completed earlier than twelve months prior to their employment on the work are not be acceptable. The Contractor is to assume all costs in connection with operator certification.

3.6 INSPECTION AND TESTS

A. The Testing Laboratory will make inspections and perform tests in accordance with the following:
   1. Verify that certification of welders is not more than one year prior to time welding work is to be performed.

2. Visually inspect all shop and field welds. Conform to American Welding Society, Structural Welding Code for Steel, AWS D1.1., current edition.

3.7 CLEANING AND PROTECTION

A. Clean all exposed facing as necessary to remove dirt and stains which may be on precast fabrications after erection. Clean precast units only after all installation procedures, joint treatment, and patching are completed. Washed and rinsed exposed surfaces in accordance with the precast fabrication manufacturer's recommendations.

B. After erection provide covers and protection to those portions of the precast installation subject to damage from subsequent construction and activities. Patch, repair or replace any precast component as herein specified.

END OF SECTION

SECTION 04 22 00

CONCRETE UNIT MASONRY

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
1. Concrete masonry units.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).
B. Indigenous Materials: Materials and products that are manufactured within 300 miles (482 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 300 miles (482 km) of Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. 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.
C. Samples: For each type and color of the following:
1. Exposed CMUs.

2. Pigmented and colored-aggregate mortar.

1.4 INFORMATIONAL SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Mockup: Refer to Section 01 43 39 – Mockups for description of construction required to complete a mockup submittal for review.
B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.
   1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches by full thickness.
C. Comply with the applicable recommendations of the TEK Information Series, National Concrete Masonry Association, (N.C.M.A.), current editions, in addition to the requirements specified herein.
D. Comply with the requirements of TMS 402/ACI 530/ASCE 5, Building Code Requirements for Masonry Structures & TMS 602/ACI 530.1/ASCE 6, Specifications for Masonry Structures, current editions.

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

PART 2 – PRODUCTS

2.1 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Tests shall comply with UL 618 “Standards of Concrete Masonry Units”.
   3. Each unit shall be stamped "Classified UL--See Certificate".

2.2 CONCRETE MASONRY UNITS

A. Sizes:
   1. 6” Nominal width: CMU-1.
   2. 8” Nominal width: CMU-2.
B. Regional Materials: CMUs shall be manufactured within 500 miles of Project site.

C. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

D. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. ACM Chemistries.
      b. BASF Corporation; Construction Systems.
      c. GCP Applied Technologies (formerly Grace Construction Products).

E. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
   2. Density Classification: Medium weight.
   3. Precast concrete masonry units, preshrunk with a maximum linear shrinkage of .065 percent when tested in accordance with ASTM C 426.

2.3 CONCRETE LINTELS

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

2.4 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be manufactured within 500 miles of Project site.

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

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

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

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

F. Aggregate for Mortar: ASTM C 144.
   1. White-Mortar Aggregates: Natural white sand or crushed white stone.
   2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

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

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

J. Water: Potable.

2.5 REINFORCEMENT

A. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Interior Walls: Mill- galvanized, carbon steel.
   2. Exterior Walls: Hot-dip galvanized carbon steel.
   3. Wire Size for Side Rods: [0.148-inch] [0.187-inch] diameter.
   4. Wire Size for Cross Rods: [0.148-inch] [0.187-inch] diameter.
   5. Spacing of Cross Rods: Not more than 16 inches o.c.
   6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 EMBEDDED FLASHING MATERIALS

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

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to percent; of width and thickness indicated; formulated from neoprene.
B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt 40 felt).

2.8 MASONRY-CELL FILL

A. Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
B. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

2.9 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 masonry cement mortar unless otherwise indicated.
   3. For exterior masonry, use portland cement-lime or masonry cement mortar.
   4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
   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, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For mortar parge coats, use Type S or Type N.
   2. For interior non-load-bearing partitions, Type O may be used instead of Type N.
D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.

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

B. Lines and Levels:
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

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

3.3 LAYING MASONRY WALLS

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

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

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

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

E. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

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

3.4 MORTAR BEDDING AND JOINTING

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

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

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

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

3.5 CONTROL/EXPANSION JOINTS

A. Provide vertical control and building expansion joints in masonry where shown on the Drawings. If not shown on the Drawings, comply with the recommendations of NCMA as reviewed by the Architect prior to construction of joint.

3.6 MASONRY-CELL FILL

A. Pour lightweight-aggregate fill into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.
B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.7 MASONRY-JOINT REINFORCEMENT

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

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   1. Provide an open space not less than 1/2-inch-wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 FLASHING

A. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
   1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
   2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
   3. Place grout only after inspectors have verified proportions of site-prepared grout.
C. Testing Prior to Construction: One set of tests.
D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.11 REPAIRING, POINTING, AND CLEANING

A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
   2. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.12 MASONRY WASTE DISPOSAL

A. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Do not dispose of masonry waste as fill within 36 inches of finished grade.
B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

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SECTION 04 42 00
EXTERIOR STONE CLADDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Dimension stone panels set with individual anchors.
B. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for installing inserts and weld plates in concrete for anchoring dimension stone cladding.
   2. Section 04 20 00 "Unit Masonry" for installing inserts in unit masonry for anchoring dimension stone cladding.

1.3 DEFINITIONS

A. Definitions contained in ASTM C 119 apply to this Section.
B. Dimension Stone Cladding Assembly: An exterior wall covering system consisting of dimension stone panels together with anchors, secondary weather barrier (sheathing), fasteners, and sealants used to secure the stone to the building structure and to produce a weather-resistant covering.
C. IBC: International Building Code.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each [variety of stone,] stone accessory, and manufactured product.
B. Shop Drawings: Show fabrication and installation details for dimension stone cladding assembly, including dimensions and profiles of stone units.
   1. Show locations and details of joints both within dimension stone cladding assembly and between dimension stone cladding assembly and other construction.
   2. Show locations and details of anchors.
   3. Show direction of veining, grain, or other directional pattern.
C. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches square.
   1. Sets shall consist of at least five Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.

1.6 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate dimension stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.
B. Installer Qualifications: A firm or individual experienced in installing dimension stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel and AWS D1.3, "Structural Welding Code - Sheet Steel."
E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of typical exterior wall area not less than 15 feet long by 10 feet high.
      a. Include typical components, attachments to building structure, and methods of installation.
      b. Include sealant-filled joint complying with requirements in Section 07 92 00 "Joint Sealants."
   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.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
   1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
   2. Store stone on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.
C. Deliver sealants to Project site in original unopened containers labeled with manufacturer's name, product name and designation, color, expiration period, pot life, curing time, and mixing instructions for multicomponent materials.

1.9 FIELD CONDITIONS

A. Protect dimension stone cladding during erection by doing the following:
   1. Cover tops of dimension stone cladding installation with non-staining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
   2. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

1.10 COORDINATION

A. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing reglets, and similar items to be used by dimension stone cladding Installer for anchoring, supporting, and flashing of dimension stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.
B. Time delivery and installation of dimension stone cladding to avoid extended on-site storage and to coordinate with work adjacent to dimension stone cladding.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Stone: Obtain stone, regardless of finish, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
   1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
   2. Make quarried blocks available for examination by Architect.
B. Source Limitations for Other Materials: Obtain each type of stone accessory and other material from single manufacturer for each product.

2.2 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
B. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system. Concrete fabrication and erection tolerances are specified in Section 03 30 00 "Cast-in-Place Concrete."

2.3 GRANITE

A. Granite: Comply with ASTM C 615.
B. Description: Refer to Drawings for color and description of granite.
C. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
D. Finish: Honed.
E. Thickness: As indicated on Drawings.

2.4 ANCHORS AND FASTENERS

A. Fabricate anchors from stainless steel, ASTM A 666, Type 304, temper as required to support loads imposed without exceeding allowable design stresses. Fabricate dowels and pins for anchors from stainless steel, ASTM A 276, Type 304.
B. Cast-in-Place Concrete Inserts: Steel, cast iron, or malleable iron adjustable inserts, with bolts, nuts, washers, and shims; all hot-dip galvanized or mechanically zinc coated, with capability to sustain, without failure, a load equal to 4 times the loads imposed as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

C. Post-installed Anchor Bolts for Concrete and Masonry: Chemical anchors, or torque-controlled expansion anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

D. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.

1. For stainless steel, use annealed stainless-steel bolts, nuts, and washers; ASTM F 593 for bolts; and ASTM F 594 for nuts, Alloy Group 1.

2.5 STONE ACCESSORIES

A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, non-staining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Concealed Sheet Metal Flashing: Fabricate from stainless steel in thicknesses indicated, but not less than 0.0156 inch thick. Comply with requirements specified in Section 07 62 00, Sheet Metal Flashing and Trim.

C. Plastic Weep Hole/Vents: One-piece, flexible extrusion manufactured from UV-resistant polypropylene copolymer, designed to weep moisture in masonry cavity to exterior, in color selected from manufacturer's standard.

D. Sealants for Joints in Dimension Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants" and do not stain stone.

2.6 STONE FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.

1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."

B. Control depth of stone and back check to maintain minimum clearance of 1 inch between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.

C. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated. Shape beds to fit supports.

D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

E. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

F. Quirk-miter corners, unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.

G. Cut stone to produce uniform joints in sizes and locations indicated on Drawings.

H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

I. Clean backs of stone to remove rust stains, iron particles, and stone dust.

J. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

2.7 SOURCE QUALITY CONTROL

A. Source Quality-Control Testing Service: Owner will employ an independent testing agency to perform source quality-control testing indicated below. Payment for these services will be made by Owner.

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

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive dimension stone cladding and conditions under which dimension stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING DIMENSION STONE CLADDING, GENERAL

A. Before setting stone clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
B. Execute dimension stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
   1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.
C. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.
D. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
   1. Sealing expansion and other joints is specified in Section 07 92 00, Joint Sealants.
F. Install concealed flashing at continuous ledges and similar obstructions to downward flow of water to divert water to building exterior.
G. Keep cavities open where unfilled space is indicated between back of stone units and backup wall.
   1. Place weep holes in joints where moisture may accumulate, including base of walls and above flashing. Locate weep holes at intervals not exceeding 24 inches. Use plastic weep hole/vents.

3.3 SETTING MECHANICALLY ANCHORED DIMENSION STONE CLADDING

A. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
B. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
C. Set stone supported on clips on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.4 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Division 07 Section "Joint Sealants."

3.5 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.
B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.

C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch.
E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.
F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

3.6 FIELD QUALITY CONTROL

A. Field Quality-Control Water Leakage Test: Test dimension stone cladding system according to AAMA 501.2.
   1. Notify Architect seven days in advance of dates and times when testing will be done.
   2. Perform test at two locations as directed by Architect.
   3. Report test results in writing to Architect and Owner.

3.7 ADJUSTING AND CLEANING

A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and dimension stone cladding that does not match approved samples and mockups. Damaged stone may be repaired if Architect approves methods and results.
B. Replace in a manner that results in dimension stone cladding's matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
C. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove excess sealant and smears as sealant is installed.
D. Final Cleaning: Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior non-load-bearing wall framing)
B. Related Sections include the following:
   1. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on drawings.
   2. Deflection Limits: Design framing systems to withstand design loads (UNO) without deflections greater than the following:
      a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 of the wall height.
   3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F
   4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
      a. Upward and downward movement of 3/4 inch, or as indicated.
B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."

2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the state of Wisconsin responsible for their preparation.
C. Welding certificates.
D. Calculations: For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by Qualified Professional Engineer responsible for their preparation.
   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips
   7. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
   1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: As required by structural performance,
   2. Coating: G60
B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance.
   2. Coating: G90.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 18-gage.
   2. Flange Width: 1-5/8 inches, min.
   3. Section Properties: As required by design.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.
   2. Flange Width: 1-1/4 inches, min.

2.3 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

2.4 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: As required by design; zinc coated.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.

C. Sealer Gaskets: Closed-cell neoprene foam, 3/8-inch-thick, peel-and-stick “Tee” shaped selected from manufacturer's standard widths to match width of bottom track or rim track members.
   1. Acceptable products include Triple Guard Energy Sill Sealer as manufactured by Protecto Wrap Company
   2. Primers & Accessories:
      a. Protecto-Tak Spray Primer.
      b. No. 100 Primer.

2.6 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
   1. Fabricate framing assemblies using jigs or templates.
   2. Cut framing members by sawing or shearing; do not torch cut.
   3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for

B. 4 installation tolerances and other conditions affecting performance.

C. 5 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing – General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
   1. Stud Spacing: As required by design, 16” maximum.
C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
      a. Install solid blocking at centers indicated on Shop Drawings.
   2. Bridging (option): Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
   3. Bridging (option): Proprietary bridging bars installed according to manufacturer's written instructions.
F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.
G. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
H. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 05 50 00

METAL FABRICATIONS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal fabrications
      a. Miscellaneous steel framing and supports.
      b. Miscellaneous steel trim.
      c. Metal bollards.
      d. Metal sign post bollards
      e. Elevator machine beams, hoist beams, and divider beams.
      f. Elevator pit ladder.
      g. Ships ladders.
   2. Madison Fire Department KNOX Box.

B. Products furnished, but not installed, under this Section include the following:
   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. 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.

1.3 ACTION SUBMITTALS

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

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.

C. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

D. Samples for Verification: For each type and finish of extruded nosing and tread.

E. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer licensed in Wisconsin responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

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

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.5 QUALITY ASSURANCE

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

B. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of Wisconsin, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Aluminum ladders shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 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 pre-consumer recycled content not less than 25 percent.
C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.
E. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
F. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners for fastening aluminum.
   2. Provide stainless-steel fasteners for fastening stainless steel.
B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
D. 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.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers (Exposed to view locations): Provide primers that comply with Section 09 91 23 “Interior Painting".
B. Water-Based Primer (interior concealed locations): Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
E. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
F. Concrete for steel bollards, bollard footings: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
C. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended.
D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

2.8 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe
   1. Cap bollards with 1/4-inch-thick steel plate.
B. Fabricate bollards with 3/8-inch-thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.
C. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch-thick steel plate welded to bottom of sleeve.
D. Prime bollards with zinc-rich primer.

2.9 PIPE OR DOWNSPOUT GUARDS

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

2.10 METAL SHIP'S LADDERS

A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
   1. Treads shall be not less than 5 inches exclusive of nosing or less than 8-1/2 inches including the nosing, and riser height shall be not more than 9-1/2 inches.
   2. Fabricate ships' ladders, including railings from steel.
   3. Fabricate treads from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.

4. Fabricate treads from abrasive-surface floor plate.
5. Comply with applicable railing requirements in Section 055213 "Pipe and Tube Railings."

B. Galvanize steel ships' ladders, including treads, railings, brackets, and fasteners.

2.11 ABRASIVE METAL STAIR NOSINGS

A. Cast-Metal Units: Cast iron, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.
   1. Products:
      a. Nosings: Two-piece units, 3 inches wide, with subchannel for casting into concrete steps.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units.

2.12 COUNTER SUPPORTS

A. Counter Support Brackets: Rakks counter support brackets, clear anodized aluminum by Rangine Corp., Needham, MA, as follows:
   1. Anodized aluminum face plates with adhesive backing, Model No. EHFP-0202.
   2. Bracket Model No. EH-1818, for countertops up to 25-inch depth, 18” x 18”, 450-pound capacity, surface-mounted.
   3. Bracket Model No. EH-1824, for countertops up to 30-inch depth, 18” x 24”, 450-pound capacity, surface-mounted.
   4. Bracket Model No. EH-1818-FM, for countertops up to 25-inch depth, 18” x 20”, 300-pound capacity, flush-mounted for countertops.
   5. Bracket Model No. EH-1824-FM, for countertops up to 30-inch depth, 18” x 26”, 300-pound capacity, flush-mounted for countertops.
   6. Bracket Model No. EH-1212, for shelf supports.

2.13 MADISON FIRE DEPARTMENT KNOX BOX

A. Key Vaults: A key box shall be installed and incorporated into the entry access bollard as located on plan and as detailed. Fabrication and installation shall comply with Madison City Ordinance 918.

B. Provide and place Fire Department alert decals (e.g. Knox Company stock #1001) on each exterior door or door frame of the building near the lock cylinder. Regarding label placement for a group of doors, one label for each pair of doors or a group of contiguous doors shall be required.

2.14 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.15 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Galvanize loose steel lintels located in exterior walls.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.16 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.17 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

2.18 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
   1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   3. Other Items: SSPC-SP 3, "Power Tool Cleaning."

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING PIPE GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch bolts at each pipe guard. Mount pipe guards with top edge 26 inches above driving surface.

3.3 INSTALLING STAIR NOSINGS

A. Install stair nosing on tread two-piece insert.
B. Two-piece nosings embedded in concrete steps or curbs, align insert nosings flush with riser faces and level with tread surfaces.

3.4 INSTALLING METAL BOLLARDS

A. Anchor pedestrian control bollards as indicated on the drawings.
B. Anchor vehicle drive bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
C. Fill bollards solidly with concrete, mounding top surface to shed water.

3.5 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with non-shrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

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SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stainless-steel pipe and tube railings.
B. Related Requirements:
   1. Section 03 41 23 "Precast Concrete Stairs" for steel tube railings associated with cast concrete stairs.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of 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 such items to Project site in time for installation.
C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.
   3. Grout and anchoring cement.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.

2. Regional Materials Certificate.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

D. Samples: For each type of exposed finish required.

E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer licensed in the State of Wisconsin responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

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

1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Stainless Steel Pipe and Tube Railings:

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:
2. Indigenous Materials: Materials and products shall be manufactured within 300 miles (482 km) of Project site.
    a. Wagner, R & B, Inc.
    b. McMaster-Carr
    c. Steele Solutions, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of Wisconsin, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
    a. Uniform load of 50 lbf / ft. applied in any direction.
    b. Concentrated load of 200 lbf applied in any direction.
    c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
    a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
    b. Infill load and other loads need not be assumed to act concurrently.

2.3 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
   1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 316L.
B. Castings: ASTM A 743/A 743M, Grade CF 8M or CF 3M.
C. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 316L.

2.5 FASTENERS

A. General: Provide the following:
   1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
   2. Hot-Dip Galvanized Railings: Type 304 stainless-steel.
B. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
   1. Material Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.6 MISCELLANEOUS MATERIALS

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

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
D. Form work true to line and level with accurate angles and surfaces.
E. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove flux immediately.
   4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
F. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
G. Form changes in direction by bending or by inserting prefabricated elbow fittings.
H. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
I. Close exposed ends of railing members with prefabricated end fittings.
J. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
K. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

L. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
M. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
N. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines, or blend into finish.
B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
C. Stainless Steel Tubing Finishes:
   1. 180-Grit Polished Finish: Uniform, directionally textured finish.
D. Stainless Steel Sheet and Plate Finishes:
   1. Directional Satin Finish: ASTM A 489/A 480, No. 4.
E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.
B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
   1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
B. Install removable railing sections, where indicated, in slip-fit metal sockets.

3.4 ATTACHING RAILINGS

A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
D. Secure wall brackets and railing end flanges to building construction as follows:
    1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
E. For hollow masonry anchorage, use toggle bolts.

3.5 ADJUSTING AND CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

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SECTION 05 53 13
BAR GRATINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes metal bar gratings and metal frames and supports for gratings.
B. Related Requirements:
   1. Section 05 12 00 "Structural Steel Framing" for structural-steel framing system components.
   2. Section 05 52 13 "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

1.3 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 gratings, grating frames, and supports. 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.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Clips and anchorage devices for gratings.
   2. Paint products.
B. Sustainable Design Submittals:

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

C. Shop Drawings: Include plans, sections, details, and attachments to other work.

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 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Sidewalks and Vehicular Driveways, Subject to Trucking: Uniform load of 250 lbf/sq. ft.or concentrated load of 8000 lbf, whichever produces the greater stress.
2. Limit deflection to L/360 or 1/4 inch, whichever is less.

2.3 METAL BAR GRATINGS

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."

B. Welded Steel Grating:
1. Bearing Bar Spacing: 7/16 or 1/2 inch o.c.
2. Bearing Bar Depth: As required to comply with structural performance requirements.
3. Bearing Bar Thickness: As required to comply with structural performance requirements.
4. Crossbar Spacing: 2-inches o.c.
5. Traffic Surface: As required for Public Works for the City of Madison.
6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft.of coated surface.

C. Pressure-Locked Steel Grating MBG 532: Fabricated by pressing rectangular flush-top crossbars into slotted bearing bars or swaging crossbars between bearing bars.
1. Bearing Bar Spacing: 7/16 or 1/2 inch o.c.
2. Bearing Bar Depth: As required to comply with structural performance requirements.
3. Bearing Bar Thickness: As required to comply with structural performance requirements.
4. Crossbar Spacing: 2-inches o.c.
5. Traffic Surface: As required for Public Works for the City of Madison.
6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft.of coated surface.

2.4 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
D. Wire Rod for Bar Grating Crossbars: ASTM A 510.
E. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30.
F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33, with G90coating.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless-steel fasteners.
B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.7 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
D. Fit exposed connections accurately together to form hairline joints.
E. Welding: Comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
   1. Fabricate toe plates to fit grating units and weld to units in shop unless otherwise indicated.
   2. Fabricate toe plates for attaching in the field.
   3. Toe plate Height: 4 inches unless otherwise indicated.
G. Do not notch bearing bars at supports to maintain elevation.

2.8 GRATING FRAMES AND SUPPORTS

A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
   1. Unless otherwise indicated, fabricate from same basic metal as gratings.
   2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4-inch-thick by 8 inches long.
B. Galvanize steel frames and supports in the following locations:
   1. Exterior.

2.9 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.
B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
D. Fit exposed connections accurately together to form hairline joints.
   1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
E. Field Welding: Comply with AWS recommendations and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

3.2 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
B. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Wood blocking.
   2. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.
B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.
C. Exposed Framing: Framing not concealed by other construction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. 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.
   2. Product Data: For installation adhesives, indicating VOC content.
   3. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low emitting materials.

1.5 INFORMATION SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Engineered wood products.
   4. Power-driven fasteners.
   5. Post-installed anchors.

1.6 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: The following wood products shall be manufactured within 300 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 300 miles of Project site.
   1. Dimension lumber.
   2. Laminated-veneer lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Dress lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

D. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
    a. Lumber treated with wood preservatives such as Pentachlorophenol, Copper 1 Naphthenate or Copper 8-quinolinolate that adversely affect the membrane when in direct contact not acceptable.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall 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.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

1. Framing for raised platforms.
2. Concealed blocking.
3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Furring.
3. Grounds.

B. Concealed Boards: 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Northern species; No. 2 Common grade; NLGA.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
B. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
   2. ICC-ES evaluation report for fastener.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 12 13
STRUCTURAL PANEL CONCRETE ROOF DECK

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Framing.
   2. Fasteners.
   3. Roof deck construction

1.2 RELATED SPECIFICATION SECTIONS

A. Section 05 20 00 Metal Joists
B. Section 05 40 00 Cold-Formed Metal Framing
C. Section 06 10 00 Rough Carpentry
D. Section 06 16 00 Sheathing
E. Section 07 01 00 Operation and Maintenance of Thermal and Moisture Protection
F. Section 07 41 00 Roof Panels
G. Section 13 40 00 Integrated Construction

1.3 SYSTEM DESCRIPTION

A. Structural Panel roof deck system consists of steel joists, trusses or wood-framing members and Structural Panel Concrete Roof Deck installed with mechanical fasteners. Structural Panel Concrete Roof Deck is a high-strength reinforced concrete panels for use in noncombustible construction, as required by the applicable building codes. Adhesives are not recommended, nor required to enhance shear performance. A suitable approved exterior roof system shall be used to complete the envelope.

1.4 REFERENCES

A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
C. ASTM A588/A588M – Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50ksi [345MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
D. ANSI/AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members
E. ANSI/AISI S210 – North American Specification for Cold-Formed Steel Framing – Floor and Roof System Design
F. ANSI/AISI S214 – North American Specification for Cold-Formed Steel Framing – Truss Design

G. ANSI/AISI S230 – Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two-Family Dwellings
H. ASTM E84-17 – Standard Test Method for Surface Burning Characteristics of Building Materials
I. ASTM E119-16 – Standard Test Method for Fire Tests of Building Construction and Materials
J. ASTM E136-16 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C

1.5 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated:
   1. Roof Framing:
      a. Deflection: minimum L/360
      b. Uniform Roof Load: 150 PSF (7.2 kPa) (Ultimate)
      c. Framing Spacing: maximum of 48 inches (1220 mm) on center
   2. Fasteners: Follow the selected fastener layout for Screw Patterns, for the design Diaphragm Loads as described in the current Progressive Engineering, Inc.'s Evaluation Report PER-14076.
   3. Panel Layout: Follow the Structural Panel Concrete Roof Deck application described in the current Progressive Engineering, Inc.'s Evaluation Report PER-14076.

B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
   ***Note**: Fire-resistance ratings may require lighter gauge framing than required for Shear- or Uniform-Loading. A structural engineer shall review and select the correct gauge framing allowed by fire-resistance and load rating*.

C. Noncombustible Ratings: Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136-16, "Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C."
   ***Note**: Materials with modified ASTM E136-16 evaluations are not acceptable*.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery:
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, brand, type and grade.

B. Storage:
   1. Store above ground in dry, ventilated space.
   2. Protect materials from soiling, and damage.
      ***Note**: If Structural Panels are frozen while stored outdoors, allow to thaw-out naturally. Do not use salts or fertilizers to defrost the panels*.
   3. Panels must be stored over stable soil. Soil must be able to carry the load of the pallets. Each 20-piece pallet weights 3500 lbs (1542 kg).
   4. Pallets must not be stacked over ±1/2 inch (13 mm) off the pallet edge.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. When mechanically fastened, do not install Structural Panel Concrete Roof Deck when ambient or conditioned temperature is below 0 °F (-18 °C).
   2. Do not apply finished roofing over Structural Panel Concrete Roof Deck when wet, frozen or containing frost.
      ***Note**: If installed panels have snow or ice, do not use salts or defrosting agents, sand is recommended over slippery surfaces*.

PART 2 – PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Structural Concrete Panel: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.

B. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 MATERIALS

A. Structural Concrete Panel:

1. USG Structural Panel Concrete Roof Deck, A noncombustible concrete roof deck manufactured in accordance with Acceptance Criteria AC318.
    a. Panel Dimensions:
        i. Thickness: 3/4 inch (19 mm)
        ii. Width: 48 inches(1220mm) for Square edge or [47-3/4 inches (1213 mm) for Tongue & Groove edge].
        iii. Lengths: [96 inches (2440 mm)] or [72 inches (1829 mm)] or [80 inches (2032 mm)]
        iv. Edges: [Square] or [Tongue & Groove]
    b. Panel Properties:
        i. Density: 75 lb/ft3 (1201 kg/m3) tested in accordance with ASTM C1185
        ii. Weight: 5.3 lbs/ft2 (25.9 kg/m2) tested in accordance with ASTM D1037 at a thickness of 3/4 inch (19mm)
        iii. pH Value: 10.5 when tested in accordance with ASTM D1293
        iv. Non-combustibility: Pass tested in accordance to ASTM E136-16
        v. Surface Burning Characteristics: when tested in accordance with ASTM E84 0 Flame Spread / 0 Smoke Developed
        vi. Mold Resistance: 10 tested in accordance with ASTM D3273, 1 tested in accordance with G21.
        vii. Termite resistance: 9.8 when tested in accordance with AWPA E1.
        viii. VOC Emissions: Low VOC compliant; tested in accordance with California Department of Public Health (CDPH/EHLB) Standard Method Version 1.1, 2010 (Emission Testing for CA Specification 01350)

B. USG Structural Panel Concrete Roof Deck Fasteners: To select the appropriate fastener to specific type of framing, reference Table 2 of Progressive Engineering, Inc.'s Evaluation Report PER-14076.

C. Roof Coverings and Roofing Membranes: Follow roof covering manufacturers' installation procedures.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, adjoining construction, and the conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

1. Steel framing to receive the USG Structural Panel Concrete Roof Deck shall be structurally sound, free from bows, twists or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of USG Structural Panel Concrete Roof Deck.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Framing Installation:

1. The roof joists and other roof framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
2. Cold-formed steel shall comply with AISI-General, with a minimum 54 mils or 0.0538-inch (1.37 mm) base metal thickness (No.16 gauge) and a minimum G60 galvanized coating.
   ***Note**: A structural engineer must review and approve the use of lighter gauge joists*.
3. The attachment flange or bearing edge must be a minimum 1-5/8 inch (41 mm) wide.
4. The panel must bear on the supporting flange or edge at least 3/4 inch (19 mm)

5. Provide a uniform and level joist bearing at wall-to-roof connections.
6. Locate joists directly over bearing studs or a header installed at the top of the load bearing wall to distribute load.
7. On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joists ends are not otherwise restrained from rotation.
8. Provide additional joists under parallel partitions and around all roof openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
9. All blocking or bridging must be installed prior to the installation of USG Structural Panel Concrete Roof Deck.
10. When 48-inch (1220 mm) on center framing spacing is installed and a sheathing single-span condition exists, additional track blocking is required perpendicular to the framing located mid-way between the edges of the panel.
11. Framing must be of good quality, free of bows, twists or other malformations.

B. USG Structural Panel Concrete Roof Deck Application:
1. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust collection device or a water-dispensing device that limits the amount of airborne dust.
   a. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel.
   b. Dispose of collected dust in a safe manner and in compliance with local, state and federal ordinances.
2. USG Structural Panel Concrete Roof Deck shall be installed in a horizontal manner (long edges perpendicular to the framing) in a running bond pattern.
   Note*: The fire and structural ratings for USG Structural Panels are based on mechanical attachment only*.
3. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed.
   a. Given that panel width is 48-inch (1220 mm), plan the layout so the first and last panel row width is a minimum of 24 inch (610 mm) wide.
   b. In the case where the row width is less than 24-inch (610 mm) wide, panels shall be blocked on all edges by framing (flat stock metal strapping is not sufficient to carry uniform loads).
4. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist.
   a. Place each panel across three or more supports (minimum two-span condition). Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member.
   b. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
5. Fasten panels following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. **Do not fasten all the corners first**.
   Note*: Fastener edge distance will vary depending on the type of framing selected, to select the appropriate fastener to specific type of framing, reference Table 2 of Progressive Engineering, Inc.'s Evaluation Report PER-14076.*
   a. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel.
   b. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris.
   c. Do not gap the panels.
   d. Install the second panel and all subsequent panels in a similar manner to complete the row.
   e. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows.
   f. Fasten outside corner of first installed panel, progressively fan out fastener installation to adjacent panel edges in a progressive manner
6. Make cutouts in panels before installing the panel whenever possible.
   a. If a cutout is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not scored.
   b. Support the ends and edges of cutouts with framing if they are larger than 6-inches (153 mm) in diameter (refer to: SCP43 Page 7 - Field Installation Guide – Panel Penetrations).

7. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board.
8. During Construction Traffic Protection – prior to roof finishing, place “sheathing materials” on the roof in high traffic areas with newly installed USG Structural Panel Concrete Roof Deck (i.e. additional USG Structural Panels or plywood).

C. Clean Up:
1. Leftover material shall be removed from the job site.
2. Remove all foreign material from the floor surface and vacuum all dust from the surface.

END OF SECTION

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SECTION 06 16 43
EXTERIOR GYPSUM SHEATHING

PART 1 – GENERAL

1.1 SUMMARY

A. Gypsum wall sheathing as shown on the Drawings and as specified herein, including
B. accessories and materials required for installation.

1.2 QUALITY ASSURANCE

A. Comply with all laws, ordinances, rule, codes and regulations of governmental authorities having jurisdiction over the work.
B. Provide sheathing materials from a single manufacturer unless otherwise approved, in writing by the Architect.
C. Provide installation of gypsum sheathing complying with the manufacturer's current printed instructions and specifications and the Recommended Specifications for the Application and Finishing of Gypsum Wall Board, Standard GA 216, Installation of Screw-Type Steel Framing Members to Receive Gypsum Wallboard, Standard GA 203, current editions of the Gypsum Association, except as herein modified and as approved by the manufacturer.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:
    1. Product Data: Submit manufacturer's specifications and installation instructions for gypsum sheathing, screws and accessories.
    2. Samples:
        a. Three (3), 12-inch x 12-inch samples of gypsum sheathing.

1.4 DELIVERY, STORAGE AND HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather. Keep materials under cover and dry. Protect against to weather and contact with damp or wet surfaces. Limit outside storage to one month or less.
B. Protect sheathing from corners breaking and damaging surfaces, while unloading.

1.5 PROJECT SITE CONDITIONS

A. Sheathing must not be left exposed to elements for more than one month unless the procedures recommended by the manufacturer are followed.
B. Coordinate the installation of gypsum sheathing with the installation of air and water barriers and other materials covering the sheathing.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Glass-Mat Faced Gypsum Exterior Sheathing Board: Complying with ASTM C 1177 & ASTM D 3273, regular, 1/2-inch-thick, (Type X, 5/8 inch thick where required to be fire rated):
   1. Securock Glass-Mat Sheathing Panels, US Gypsum.
   2. e²XP Extended Exposure Gypsum Sheathing, National Gypsum.
   3. GlasRoc, CertainTeed.
   4. Weather Defense, Platinum Sheathing, Continental Building Products.
   5. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated, as recommended by gypsum sheathing manufacturer for substrates indicated and in accordance with applicable standards, complying with applicable Federal Specifications.
   1. Provide fasteners with a hot-dip zinc coating, ASTM A 153.
   2. Fastening to Metal Studs: Use 1-1/2-inches long, galvanized, screws of type recommended by gypsum sheathing and metal stud manufacturers.

PART 3 – EXECUTION

3.1 INSTALLATION – GENERAL

A. Set work to required levels and lines, with members plumb and true to line and cut and fitted.
B. Securely attach work to substrate by anchoring and fastening as shown and as required by recognized standards.
C. Predrill for fasteners as required.

3.2 INSTALLING - GYPSUM WALL SHEATHING

A. General: Fasten to exterior face of gypsum sheathing to stud framing for exterior walls. Space fasteners as recommended by gypsum sheathing manufacturer. Keep perimeter fasteners 3/8 inch from edges and ends of board units. Fit boards tightly against each other and around openings.

END OF SECTION

SECTION 06 41 16

PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets that are not concealed within other construction.

B. Related Requirements:
   1. Section 12 36 61.19 "Simulated Stone Countertops."

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer 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. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
5. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
6. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For plastic-laminate-faced architectural cabinets.
1. Include plans, elevations, sections, and attachment details.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
4. Apply AWI Quality Certification Program label to Shop Drawings.

D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.
1. Plastic laminates, for each color, pattern, and surface finish.
2. Thermoset decorative panels, for each color, pattern, and surface finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.
B. Product Certificates: For each type of product.
C. Quality Standard Compliance Certificates: AWI Quality Certification Program.
D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
1. Shop Certification: AWI's Quality Certification Program accredited participant.

B. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 – PRODUCTS

2.1 PLASTIC-LAMINATE-FACED 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 inspections of fabrication and installation together with labels and certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Grade: Premium.
C. Regional Materials: Wood products shall be manufactured within 300 miles (480 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 300 miles (480 km) of Project site.
D. Certified Wood: Wood products shall be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004.
E. Type of Construction: Frameless.
F. Door and Drawer-Front Style: Flush overlay.
G. 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
        a. Formica Corporation.
        b. Pionite: a Panolam Industries International, Inc. brand.
        c. Wilsonart International Holdings, Inc.
        d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
H. Laminate Cladding for Exposed Surfaces:
    1. Horizontal Surfaces: Grade HGS.
    2. Vertical Surfaces: Grade VGS.
I. Materials for Semi-Exposed Surfaces:
    1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
    2. Drawer Sides and Backs: Solid-hardwood lumber.
    3. Drawer Bottoms: Hardwood plywood.
J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
K. Drawer Construction: Fabricate with exposed fronts fastened to sub-front with mounting screws from interior of body.
    1. Join sub-fronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the selected material.

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. Wood Moisture Content: 5 to 10 percent.
B. Composite Wood and Agrifiber 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. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 100 percent.
C. Composite Wood Products: Products shall be made without urea formaldehyde.
D. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
    1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
    2. Particleboard: ANSI A208.1, Grade M-2.
    3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
    4. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials 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. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."

B. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish numbers indicated:
   1. Satin Chrome: BHMA 626 /652.
   2. Satin Stainless Steel: BHMA 630.
   3. For concealed hardware, provide manufacturer’s standard finish that complies with product class requirements in BHMA A156.9.

C. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

D. Frameless Concealed Hinges (European Type): Totally concealed spring-activated, self-closing European type cabinet hinges for vertical, horizontal, and depth adjustment, not less than 165 degrees opening, except provide 90-degree opening where door may strike adjacent walls or cabinets. Nickel plated.
   1. Acceptable manufacturers and products:
      a. Hafele America, Co; Duomatic #0.329.06.
      b. Grass America, Inc.; #3903.
      c. Hettich America; Euromat Topsafe #4955.
      d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

E. Center Pivot Hinges: Totally concealed spring-activated, self-closing European type cabinet hinges for Trash / Recycling Containers. Nickel plated.
   1. Acceptable manufacturers and products:
      a. E.R. Butler & Co Manufacturing.
      b. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

F. Back-Mounted Pulls
   1. Doug Mockett, DP105A/2.
   2. Finish: 26M Matte Chrome.
   3. Size 4-3/16” 3/8” profile.

G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

H. Drawer Slides: BHMA A156.9, B05091.
   1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
   2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
   3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
   4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
   5. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
   6. Trash Bin Slides: Grade 1HD-200; for trash bins not more than 20 inches high and 16 inches wide.

I. Door Locks: BHMA A156.11, E07121.

J. Drawer Locks: BHMA A156.11, E07041.

K. Grommets for Cable Passage through Countertops (MA-3): Size: 7-3/32" x 1-25/32" overall fitting into a slot 6-7/8" x 1-9/16" square. 3/4" deep.

1. Product: Subject to compliance with requirements, provide product by Doug Mockett & Company, Inc. Refer to Material Tag Index.
    a. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
2. Finish: Match hardware.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
C. Adhesives: Do not use adhesives that contain urea formaldehyde.
D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
    1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
D. Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.
E. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
F. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
G. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
    1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4-Inch-Thick or Less: 1/16 inch. Edges of Rails and Similar Members More Than 3/4-Inch-Thick: 1/8 inch.
    2. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch.
H. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
I. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 – EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
   1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
   2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips and toggle bolts through metal backing or metal framing behind wall finish where no blocking.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
B. Clean, lubricate, and adjust hardware.
C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION

SECTION 07 13 26
BLINDSIDE SELF-ADHERING SHEET WATERPROOFING
OPTION C – HORIZONTAL AND VERTICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

A. Carlisle Coatings and Waterproofing Blindside Waterproofing System utilizes the MiraPLY-H Waterproofing System fully adhered to poured concrete. The dual membrane is comprised of TPO and Butyl Alloy adhesive with a total thickness of 70 mils.

B. Carlisle Coatings and Waterproofing Blindside Waterproofing System utilizes the MiraPLY-V Waterproofing System fully adhered to poured concrete. The dual membrane is comprised of TPO and Butyl Alloy adhesive with a total thickness of 47 mils.

1.3 REFERENCE STANDARDS

A. ASTM D 412 Standard Test Methods for Rubber Properties in Tension
B. ASTM D 570 Standard Test Methods for Water Absorption of Plastics
C. ASTM D 624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
D. ASTM D 882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
E. ASTM D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
F. ASTM D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
G. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

H. ASTM D 3767 Standard Practice for Rubber - Measurements of Dimensions
I. ASTM D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
J. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
K. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.4 QUALITY ASSURANCE

A. MiraPLY-H Blindside Waterproofing System and MiraPLY-V Blindside Waterproofing System must be installed by a Carlisle Coatings & Waterproofing Inc Authorized Applicator in compliance with shop drawings approved by Carlisle Coatings & Waterproofing Inc. There must be no deviations made from Carlisle's specifications or details without the prior approval from Carlisle Coatings & Waterproofing Inc.
B. The Contractor shall employ a third-party independent observer (TPIO) to confirm compliance with the manufacturer’s requirements and the general intent of all blindside waterproofing scope of work. The TPIO must be present at all blindside waterproofing and affiliated work. The TPIO shall attend all construction meetings and shall provide daily reports on a bi-weekly basis.
C. A pre-installation meeting shall be coordinated by the General Contractor and attended by the waterproofing applicator, the TIPO, and other trades working on the Blindside System both before and after installation. The purpose of this meeting is to discuss the necessity of ensuring proper waterproofing membrane protection during all phases of installation and to review other applicable requirements or unusual field conditions.
D. Provide primary materials which are the products of one manufacturer, for each type of material required for the work.
E. Upon request by the authorized applicator and in coordination with the TPIO, an inspection will be conducted by a Carlisle Coatings & Waterproofing Inc representative to ensure that the waterproofing membrane has been installed according to Carlisle Coatings & Waterproofing Inc specifications and details. This inspection shall be coordinated prior to installing the Blindside components so that access to the membrane is not impaired.
F. An in-progress inspection shall be scheduled after the initial inspection (after the membrane installation is completed) to ensure proper protection procedures are being followed to prevent possible damage to the membrane during the installation of above membrane components.

1.5 SUBMITTALS

A. General: Submit in accordance with Section 01 33 23.
B. Product Data: Submit manufacturer's product literature and installation instructions.
C. Subcontractor’s approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.
D. Warranty Submit a sample warranty identifying the terms and conditions stated in Section 1.06.

1.6 WARRANTY

A. Provide a written, single-source warranty for all system components agreeing to promptly make repairs or replace defective waterproofing system materials without additional cost to the owner during the warranty period.
B. A 10-year System Warranty is available for a charge on commercial buildings and applies only to products manufactured or marketed by Carlisle Coatings & Waterproofing Inc. The membrane system is defined as membrane, flashings, adhesives, sealants and other Carlisle brand products utilized in this installation. For a complete description of these products, refer to the “Products Section” or the applicable “Attachment” in the Carlisle specifications.
C. Access for warranty service - it shall be the owner's responsibility to expose the waterproofing membrane assembly in the event warranty service is required.
D. For the MiraPLY-V Warranty: the formation or presence of mold or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of Carlisle and Carlisle shall not be responsible for any claims, repairs, restoration or damages relating to the presence of any irritants,

contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

1.7 JOB CONDITIONS

A. Coordination between various trades is essential to avoid unnecessary traffic to prevent damage to the membrane. Heavily traveled areas must be protected by placing temporary protection courses to prevent damage to the membrane.
B. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to the specified areas for the time needed to complete the application.
C. Protect adjoining surfaces not to be waterproofed against damage or soiling. Protect plants, vegetation and animals which might be affected by waterproofing operations.
D. Wear applicable protective clothing and respiratory protection gear.
E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with the following information.
   1. Name of material
   2. Manufacturer’s stock number and date of manufacture
   3. Material safety data sheet
B. Store membrane and accessory products in a protected area out of direct sunlight and between 40ºF and 100ºF. Protect from rain, physical damage and construction traffic.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide products manufactured and supplied by Carlisle Coatings & Waterproofing Inc, 900 Hensley
B. 15 Lane, Wylie Texas 75098, phone (800) 527-7098, fax (972) 442-0076.
C. 16 B. The components of this Blindside System are to be products of Carlisle Coatings & Waterproofing Inc. The
D. 17 installation, performance or integrity of products by others is not the responsibility of Carlisle Coatings &
E. 18 Waterproofing Inc and is expressly disclaimed by the warranty.

2.2 19 2.2 MEMBRANE

A. MiraPLY-H Sheet Membrane: Shall be CCW-MiraPLY-H self-adhering adhesive coated membrane, and shall meet or exceed the requirements listed in charts found on Technical Data Sheet.
B. MIraPLY-V Sheet Membrane: Shall be CCW-MiraPLY-V self-adhering adhesive coated membrane, and shall meet or exceed the requirements listed in charts found in section 2.

2.3 VAPOR RETARDER

A. MiraPLY-H Sheet Membrane: Shall be CCW-MiraPLY-H self-adhering adhesive coated membrane, and shall meet or exceed the requirements listed in charts found on Technical Data Sheet.

2.4 HOT-APPLIED LIQUID MEMBRANE

A. Shall be CCW-500R, supplied by Carlisle Coatings & Waterproofing, Inc.
   1. Hot-applied liquid membrane: Shall be CCW-500 Hot-Applied Membrane, rubberized asphalt compound, and shall meet or exceed the requirements of CGSB-37.50-M89.

2. Reinforcing fabric: Shall be CCW-500 Reinforcing Fabric which is a 1.18 oz/square yard spunbond polyester fabric.
3. Flashings: Shall be CCW-711-90 90-Mil Sheet Membrane and Flashing or CCW 60-mil uncured neoprene for non-exposed areas and Sure-Seal® EPDM, Sure Weld 120-mil AFX TPO or Sure Seal Fleeceback 115-mil EPDM for exposed areas.
4. Surface Primer: Shall be CCW-550 Primer.
5. Mastic: Shall be CCW-550, CCW-702, CCW-702LV or CCW-AWP.
6. Sealants: Shall be CCW-703 Vertical Grade LIQUISEALTM Membrane or CCW-201 two component Polyurethane Sealant.
7. Backer Rod: Shall be closed-cell polyethylene foam rod.
8. Expansion Joints: Shall be the EJ-500
9. Protection Course: Shall be CCW Protection Board-HS or H.
10. Root Barrier: Shall be the CCW Root Barrier
11. Drainage Composite: Shall be CCW MiraDRAIN as recommended by the manufacturer for each condition.
12. Insulation: Shall be extruded or expanded polystyrene insulation with a minimum 40 psi (or as specified by architect) compressive strength as manufactured by Insulfoam, Foamular or Dow.
13. CCW 200V, CCW 300 HV or H.P Protective Mat shall be applied over insulation prior to overburden placement.

2.5 MIRAPLY-H RELATED ACCESSORY PRODUCTS

A. Seam Tape: MiraPLY Seam Tape, MiraPLY Seam Tape LT or SecurTAPE – 6” wide
B. Detailing Tapes: Shall be:
   1. MiraPLY Detail Tape – 6” wide
   2. P/S Elastoform Flashing
C. Primers:
   1. Low VOC Primer
   2. HP-250 Primer
   3. CAV-GRIP
D. Termination Sealant:
   1. Sure-Seal Lap Sealant
   2. Universal Single Ply Sealant
E. Detail Sealants:
   1. Sure-Seal Lap Sealant
   2. Universal Single Ply Sealant
   3. DOW 758
F. 2-Part Liquid Membrane: CCW-703V LiquiSeal
G. Reinforcing Fabric:
   1. CCW-LiquiFiber-6”, 12” wide
H. Termination Bar: Sure-Seal Termination Bar
I. Water Stop: CCW MiraSTOP
J. Backer Rod: Closed-cell polyethylene foam rod
K. Expansion joints: EJ-500
L. Drain Composite: CCW MiraDRAIN Drainage Composite as selected per project
M. Perimeter Drainage System: Where required, shall be CCW MiraDRAIN HC
N. Cleaner: Weathered Membrane Cleaner or approved equal

2.6 MIRAPLY-V RELATED ACCESSORY PRODUCTS

A. Seam Tape: Shall be SecurTAPE – 6” wide
B. Detailing Tapes: Shall be:
   1. CCW-Detail Tape – 2”, 6” wide
   2. P/S Elastoform Flashing
C. Primers shall be:
   1. Low VOC Primer
   2. HP-250 Primer

D. Termination Sealant:
   1. Sure-Seal Lap Sealant
E. Detail Sealants:
   1. Sure-Seal Lap Sealant
   2. Universal Single Ply Sealant
F. 2-Part Liquid Membrane: CCW-703V LiquiSeal
G. Reinforcing Fabric:
   1. CCW-LiquiFiber – 6", 12" wide
H. Termination Bar: Shall be Sure-Seal Termination Bar
I. Water Stop: CCW MiraSTOP
J. Backer Rod: Closed-cell polyethylene foam rod
K. Expansion joints: EJ-500
L. Drain Composite: CCW MiraDRAIN Drainage Composite as selected per project
M. Perimeter Drainage System: Where required, shall be CCW MiraDRAIN HC
N. Cleaner: Weathered Membrane Cleaner or approved equal
O. Reinforcing Membrane/Flashing: Sure-Seal P/S Elastoform Flashing

2.7 CARLISLE BLINDSIDE PHYSICAL PROPERTIES MIRAPLY-H

A. Please refer to Technical Data Sheet.

2.8 CARLISLE BLINDSIDE PHYSICAL PROPERTIES MIRAPLY-V

Property	Method	Unit	Typical Value
TPO	—	mils (mm)	22 (.56)
Butyl Alloy	—	mils (mm)	25 (.64)
Thickness per ASTM D 5147 across sheet	ASTM D1970	mils (mm)	47 (1.19)
Water Vapor Transmission	ASTM E96 (Water Method)	perms	0.100
Tensile Strength[1]	ASTM D882	psi	1,360
300% Modulus[1]	ASTM D412	psi	1,390
90° T-Peel	ASTM D1876	lb.	>5.0
Elongation @ Break @ 23°C (Die C)[1]	ASTM D412	%	335
Flexibility Temperature @ -29ºC (-20ºF)[1]	ASTM D1970	pass/fail	No Cracking @-29ºC (-20ºF)
Hydrostatic Pressure Resistance	ASTM D5385	ft.	>231 ft. (100 psi)
Peel Strength Over Poured Concrete (tested w/2" strips)	ASTM D903	lb.	5.6
Puncture Resistance Elongation	ASTM E154	in	4.9
Puncture Resistance Load at Puncture	ASTM E154	lb.	106.4
Tear Strength of Vulcanized Rubber and Thermoplastics Die C[1]	ASTM D624	psi	685
Soil Decay Testing- E 96 Permeance	ASTM E154		Pass

Soil Decay Testing- Weight Loss	ASTM E154		Pass
Lateral Water Migration Re-sistance[2]	ASTM D5385 modified		Pass at 100 psi (231 ft) of hydrostatic pressure

[1]Data Listed according to Machine Direction criteria where applicable
[2]Lateral water migration resistance test is performed by casting concrete against butyl side of membrane with a hole and applying a hydrostatic head pressure with water. This test measures the resistance of lateral water migration between membrane and concrete.

PART 3 – EXECUTION

3.1 GENERAL

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all lagging and support for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.

3.2 SUBSTRATE REQUIREMENTS

A. The substrate shall be even without noticeable high spots or depressions, smooth, free of protrusions, debris, sharp edges or foreign materials and must be free of accumulated water, ice and snow. For MiraPLY-H system, earth, crushed stone, or soil shall be compacted such that the soil is not displaced from traffic or concrete placement.
B. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.
C. All work shall be performed in accordance with Carlisle-CCW application instructions.

3.3 INSTALLATION: HORIZONTAL

A. Refer to the applicable Manufacturer's Technical Data Bulletins for cautions and warnings.
B. All substrates shall be smooth and even. Concrete substrate should likewise be smooth and monolithic. Gaps or voids greater than 0.5in (12mm) shall be filled. Gravel sub-base must be 3/4" or smaller aggregate, level and compacted. Install MiraDRAIN over sub-base before installing MiraPLY-H, if substrate requirements cannot be met or required by project requirements. There is to be no standing water.
C. CCW MiraDRAIN Composites by Carlisle Coatings and Waterproofing is an acceptable substrate. Install CCW MiraDRAIN with fabric side facing down.
D. Always comply with the instructions found in manufacturer's literature, which includes:
    1. Apply the product with the TPO surface against the prepared surface and the butyl alloy adhesive side facing up.
    2. Carefully position successive sheets to overlap the previous sheet by 3 in. (75mm) minimum along the lap line. Be sure the product lays flat with no openings. End laps must be staggered.
    3. For side laps simultaneously remove the release liner on the FAT (factory applied tape) pre-primed strip then mate the two sheets together.
    4. For end laps, position the MiraPLY Seam Tape in the lap area. Remove release liner on the MiraPLY Seam Tape and mate the two sheets together. For SecurTAPE option, the TPO and Butyl surfaces of lap area shall be clean and primed with HP-250 Primer or Low VOC Primer and allow to flash off then position SecurTAPE 6" in the lap area. Remove release liner on the SecurTAPE and mate two sheets together. Lap area shall be rolled with firm hand pressure to ensure a continuous bond is achieved.

3.4 INSTALLATION: VERTICAL

A. Refer to the applicable Manufacturer's Technical Data Bulletins for cautions and warnings.

B. All substrates shall be smooth and even. Concrete substrate should likewise be smooth and monolithic. Gaps or voids greater than 0.5in (12mm) shall be filled.
C. Cover soil retention systems with CCW MiraDRAIN Composites by Carlisle Coatings and Waterproofing. Install CCW MiraDRAIN with fabric side facing toward grade/blind side.
D. Always comply with the instructions found in manufacturer's literature, which includes:
   1. Start the installation at one corner of the building. Unroll the first sheet of MiraPLY-V and install it square/parallel to building wall centered in the corner with the TPO side facing the MiraDRAIN attached to the soil retention system (lagging, sheet pile, shotcrete, etc.) and the adhesive/release liner facing out. Mechanically fasten the membrane vertically, use fasteners with plastic washer heads that are compatible with the substrate. Ensure MiraPLY- V is not bridging or wrinkled and tight to the corner with no seams in the corner. Install an adequate number of fasteners across the top of the MiraPLY-V to support and keep the membrane tight against the substrate without wrinkles and blousing until concrete is poured. Walls higher than 8'-0" require fasteners in the field of the MiraPLY V membrane with approximately 1 fastener per 2 ft2 (not including fasteners at the perimeter). Fasten perimeter edges of MiraPLY approximately 12" on center and a minimum of 6" from the edge. Caution – over driven fasteners can cause stress in the membrane and seams.
   2. Unroll the the next sheet of MiraPLY-V and align parallel to and overlap the preceding roll of MiraPLY-V 3" and a minimum 3" end overlap. Stagger end laps. Ensure that the membrane lays flat and no openings are visible. Make sure that the TPO side of the lap is clean, dry and free of contaminants and prime TPO with HP-250 Primer or Low VOC Primer.
   3. Remove the release liner on the lap (edge of the sheet) and mate the two sheets together. Lap area shall be rolled with a hard rubber roller using firm hand pressure.
   4. Leave the plastic liner on MiraPLY-V until ready for concrete pour or placement of rebar. Cover fasteners with a 3-inch x 3-inch piece of SecurTAPE, P/S Elastoform Flashing or CCW Detail Tape.

3.5 INSTALLATION: HOT-APPLIED LIQUID MEMBRANE

A. Inspection
   1. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.
   2. Condition of Concrete Surfaces:
      a. The concrete surfaces shall be of sound structural grade, 3500 psi minimum, and shall have a wood float or fine broom finish, free of fins, ridges, voids or entrained air holes.
      b. Concrete shall be cured by water curing method. Curing compounds must be of the pure sodium silicate type and be approved by the Carlisle representative.
      c. Concrete shall be cured at least 14 days and shall be sloped for proper drainage.
      d. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non-shrink grout or ground to match the un-repaired areas.
      e. Two-stage drains shall have a minimum three-inch flange and be installed with the flange flush and level with the concrete surface.
      f. Surfaces at cold joints shall be on the same plane.
B. Surface Preparation
   1. The concrete surface must be thoroughly clean, dry and free from any surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.
   2. Detail expansion joints per manufacturer's recommendation using the EJ-500.
   3. Apply a thin film of CCW-550, CCW-702, CCW-702LV or CCW-AWP primer 16" wide, centered over sealed cracks and joints. Apply 60-90 mils of CCW-550, CCW-702, CCW-702LV or CCW AWP membrane to cover primed areas. Install a 12" wide strip of CCW-711-90 centered over joints and cracks greater than 1/16" in width.
   4. Preferred Flashing Method (500-4B): Apply CCW-550, CCW-702, CCW-702LV or CCW-AWP Primer at the juncture of all horizontal surfaces and vertical surfaces to the height indicated on the drawings (eight inches min. recommended), such as parapet walls, curbs, columns and all penetrations through the deck at at the published sq. ft. per gallon rate recommended. Avoid puddles. Allow primer to dry for 1 hour minimum, 8 hours maximum. Membrane will not properly adhere to wet primer. Apply 60-90 mils of CCW-500 membrane to cover primed areas. Install CCW-711-90 mil sheet membrane or uncured neoprene flashing into this first course of CCW-500 to cover the vertical section and extend six inches

onto deck surface. Flashing installation may be done during crack and joint treatment or during installation of the first layer of CCW-500 membrane. Completely cover all flashing material during installation of the subsequent layers of CCW-500 membrane.

5. Install Sure-Seal EPDM, Sure Weld 120-mil AFX TPO or Sure Seal Fleeceback 115-mil EPDM flashings in exposed areas per Carlisle recommendations (500-4A). Always clean and prime per Carlisle splice procedure prior to application of CCW-500 membrane.
6. Apply a thin film of CCW-550, CCW-702, CCW-702LV or CCW-AWP Primer in a four-foot square area around drains. Allow primer to dry, one hour minimum, eight hours maximum. Apply 60-90 mils of CCW-500 membrane to cover primed areas. Install a three-foot square section of CCW-711-90 or uncured neoprene flashing over the drain and onto the deck. No splices or seams are allowed within three inches of the drain flange. Terminate the flashing under the clamping ring of the drain and cut away the inner portion of the flashing. Use firm pressure to press the flashing against the CCW 500 surface and ensure good adhesion. Do not interfere with weep holes. Completely cover all flashing material during installation of the subsequent layers of CCW-500 membrane.

C. 4 C. Application
1. Apply CCW-550, CCW-702, CCW-702LV or CCW-AWP primer to all surfaces and at the juncture of all horizontal surfaces and vertical surfaces, to the height indicated on the drawings (eight inches min. recommended), such as parapet walls, curbs, columns and all penetrations through the deck, to receive CCW-500 Waterproofing Membrane, including over flashings at the published sq. ft. per gallon rate recommended. Avoid puddles. Allow primer to dry for one hour minimum, eight hours maximum. Membrane will not properly adhere to wet primer.
2. Heat CCW-500 Membrane blocks in a twin wall kettle with continuous agitation and apply at 350ºF or between temperatures of 325ºF to 375ºF. (Caution: Do not exceed maximum safe operating temperature of 375°F.).
3. Apply heated CCW-500 Hot Applied Membrane to primed area and any pre-installed flashings at a rate of 18 sq. ft. per gallon or as required to obtain an average thickness of 90 mils.
4. Apply CCW-500 Reinforcing Fabric and any required flashings while membrane is still warm and tacky. Cut and trim off any wrinkles or overlap sections of the reinforcing fabric or hot the fabric splices together with CCW-500.
5. Apply a second coat of CCW-500 Hot Applied Membrane at a rate of 13 sq. ft. per gallon or as required to obtain an average thickness of 125 mils. Total thickness of the CCW-500-R System shall be 215 mils.
6. Apply CCW Protection Board H or HS into the last course of CCW-500 and splice the protection board seams together with CCW-500.

D. Integrity Testing
1. Test is required for all expanded warranties beyond the standard material warranty of horizontal applications.
2. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires 2” minimum head of water for a period of 24 hours.

E. Protection Course
1. Install CCW MiraDRAIN HC Perimeter Drainage System as the first course of drainage composite immediately after membrane has cured on vertical surfaces. Install CCW MiraDRAIN Drainage Composite to complete the drainage and protection System on Vertical installations.
2. Install CCW MiraDRAIN 9000 or 9900 over CCW Protection Board immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the CCW-500 membrane from damage by other trades. Apply CCW Root Barrier in planter areas and green roofs covered with soil and plants. Apply over Protection Board and beneath the MiraDRAIN. CCW Root Barrier splices are a minimum of four feet and taped with CCW MiraDRAIN Drainage Composite Board.

END OF SECTION

SECTION 07 13 52

MODIFIED BITUMINOUS SHEET WATERPROOFING

BLINDSIDE WATERPROOFING OPTION S – HORIZONTAL AND VERTICAL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Work shall include, but is not limited to, the following:
1. Preparation of all field and flashing substrates.
2. Drainage mat, mechanically fastened.
3. Protection board, mechanically fastened.
4. SBS-modified bitumen vertical field membrane.
5. SBS-modified bitumen horizontal field membrane.
6. Protection sheet, self-adhered.
7. Liquid-applied, reinforced flashings.

8. All related materials and labor required to complete specified waterproofing necessary to receive specified manufacturer's warranty.

1.3 DEFINITIONS

A. ASTM D 1079 – Definitions of Term Relating to Roofing and Waterproofing.
B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.4 REFERENCES

A. American Standard of Testing Methods (ASTM):
1. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
2. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
3. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
4. ASTM D 412 - Standard Test Method for Tensile Strength and Ultimate Elongation.
5. ASTM D 5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
6. ASTM D 5385 (modified) – Standard Test Method for Lateral Water Migration.
7. ASTM D 5601 - Standard Test Method for Tearing Resistance of Roofing and Waterproofing Materials and Membranes.
8. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
9. ASTM E 154 - Standard Test Method for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
10. ASTM D 1876 - Standard Test Method for Lap Peel Adhesion.
11. ASTM D 570 - Standard Test Method for Water Absorption.
12. ASTM D 1434 - Standard Test Method for Methane Gas Permeability.
13. ASTM D 1894 - Standard Test Method for Coefficient of Friction.

1.5 ACTION SUBMITTALS

A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
C. Sample/Specimen Warranty from the manufacturer and contractor.
D. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor Certification: Submit written certification from waterproofing manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

1.7 CLOSEOUT SUBMITTALS

A. Warranty: Provide manufacturer's and contractor's warranties upon substantial completion of the waterproofing.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Manufacturer shall have 20 years of experience manufacturing SBS-modified bitumen waterproofing materials.
2. Provide specified warranty upon satisfactory project completion.
B. Contractor Qualifications:

1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
2. Contractor shall provide full time, non-working, on-site superintendent experienced with the specified waterproofing through satisfactory project completion.
3. Applicators shall be skilled in the application methods for all materials.
4. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
5. Contractor shall maintain a copy of all submittal documents, on-site, available at all times, for reference.

C. The Contractor shall employ a third-party independent observer (TPIO) to confirm compliance with the manufacturer's requirements and the general intent of all blindside waterproofing scope of work. The TPIO must be present at all blindside waterproofing and affiliated work. The TPIO shall attend all construction meetings and shall provide daily reports on a bi-weekly basis.

1.9 DELIVERY, STORAGE AND HANDLING

A. Refer to each product data sheet or other published literature for specific requirements.
B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
E. Carefully store waterproofing membrane materials delivered in rolls on-end with selvage edges up. Store and protect roll storage to prevent damage.
F. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.10 SITE CONDITIONS

A. Safety:
1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
2. Heat-welding shall include heating the specified membrane ply using propane roof torches or electric hot-air welding equipment. The contractor shall determine when and where conditions are appropriate to utilize heat-welding equipment. When conditions are determined by the contractor to be unsafe to proceed, equivalent SBS-modified bitumen materials and methods shall be utilized to accommodate requirements and conditions.
3. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot work operations.
4. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified liquid-applied, or semi-solid waterproofing materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
5. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

B. Environmental Conditions:
1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.

2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of waterproofing materials. Ensure all waterproofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
3. Self-adhered membrane application: During cold weather, store the specified self-adhered membrane and primer materials in heated storage areas to ensure materials remain no less than 70 degrees F (21 degrees C) during application. Ensure conditions allow primer to remain tacky, but not wet so that primer will transfer to finger when touched. Self-adhered primer should not fully dry and lose tack before applying the self-adhered membrane. Ensure conditions remain satisfactory to achieve membrane adhesion as specified.
4. Heat-Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to proceed with the use of torches and hot-air welding equipment. Combustibles, flammable liquids and solvent vapors that represent a hazard shall be eliminated and primers shall be fully dry before proceeding with heat-welding operations. Refer to NRCA CERTA recommendations.

1.11 WARRANTY

A. Manufacturer's Warranty: The manufacturer shall provide the owner with the manufacturer's warranty providing labor and materials for a period of 10 years from the date the warranty is issued.
B. The contractor shall guarantee the workmanship and shall provide the owner with the contractor's warranty covering workmanship for a period of 2 years from completion date.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Single Source Manufacturer: All products shall be provided by a single supplier with 20 years or more waterproofing manufacturing history in the US.
   1. Comply with the Manufacturer's requirements as necessary to provide the specified warranty.
B. Product Quality Assurance Program: Manufacturer shall be an ISO 9001 registered company.
C. Acceptable Manufacturer:
   1. Soprema, located at: 310 Quadral Dr.; Wadsworth, OH 44281; Tel: 800-356-3521; Tel: 330-334-0066; Website: www.soprema.us.
   2. Acceptable Alternate Manufacturers: Tremco and Carlisle.

2.2 WATERPROOFING SYSTEM

A. Waterproofing Basis of Design:
   1. Soprema

2.3 BLINDSIDE WATERPROOFING

A. Vertical Field Membrane:
   1. SBS-Modified Bitumen:
      a. Soprema Colphene BSW V: SBS-modified bitumen, self-adhesive membrane with release film on the bottom surface and a sanded top surface used for vertical blindside waterproofing applications. Composite reinforcement. DUO SELVEDGE side laps.
         i. Thickness: 120 mils (3.0 mm)
         ii. Width: 39.4 in (1 m)
         iii. Length: 32.8 ft (10 m)
         iv. Adhesion of Poured Concrete (ASTM D 903 modified): 24.2 lbf/in (4235 N/m)
         v. Puncture Resistance (ASTM E154): 350 lb (1557 N)
         vi. Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)
         vii. Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)

viii. Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)
ix. Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %
x. Low Temperature Flexibility (ASTM D 1970): Unaffected at -4ºF (-20°C)
xi. Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)
xii. Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9ºF (-23°C)
xiii. Lap Peel Adhesion (ASTM D 1876): 7.7 lbf/in (1360 N/m)
xiv. Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m2)
xv. Water Absorption (maximum) (ASTM D 570): 0.5 %
xvi. Methane Gas Permeability (ASTM D 1434): 1.6*10−6ft²/hr at 14.7 psia (4.12*10−7 cm²/sec at 1 atm)
xvii. Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.03 static 0.76 kinetic
xviii. Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.84 static 0.67 kinetic

b. Soprema Colphene BSW H: SBS-modified bitumen membrane with plastic burn-off film on the bottom surface and a sanded top surface used for vertical blindside waterproofing applications. Polyester reinforcement.
i. Thickness: 140 mils (3.5 mm)
ii. Width: 39.4 in (1 m)
iii. Length: 32.8 ft (10 m)
iv. Adhesion of Poured Concrete (ASTM D 903 modified): 19.6 lbf/in (3430 N/m)
v. Puncture Resistance (ASTM E154): 311 lb (1383N)
vi. Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)
vii. Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)
viii. Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)
ix. Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %
x. Low Temperature Flexibility (ASTM D 1970): Unaffected at -4ºF (-20°C)
xi. Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)
xii. Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9ºF (-23°C)
xiii. Lap Peel Adhesion (ASTM D 1786): 7.7 lbf/in (1360 N/m)
xiv. Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m2)
xv. Water Absorption (maximum) (ASTM D 570): 0.5 %
xvi. Methane Gas Permeability (ASTM D 1434): 1.6*10−6ft²/hr at 14.7 psia (4.12*10−7 cm²/sec at 1 atm)
xvii. Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.04 static 0.71 kinetic
xviii. Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.75 static 0.63 kinetic

B. Horizontal Field Membrane:
1. SBS-Modified Bitumen:
a. Soprema Colphene BSW H: SBS-modified bitumen membrane with plastic burn-off film on the bottom surface and a sanded top surface used for horizontal blindside waterproofing applications. Polyester reinforcement.
i. Thickness: 140 mils (3.5 mm)
ii. Width: 39.4 in (1 m)
iii. Length: 32.8 ft (10 m)
iv. Adhesion of Poured Concrete (ASTM D 903 modified): 19.6 lbf/in (3430 N/m)
v. Puncture Resistance (ASTM E154): 311 lb (1383N)
vi. Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)
vii. Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)
viii. Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)
ix. Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %
x. Low Temperature Flexibility (ASTM D 1970): Unaffected at -4ºF (-20°C)
xi. Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)
xii. Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9ºF (-23°C)
xiii. Lap Peel Adhesion (ASTM D 1786): 7.7 lbf/in (1360 N/m)
xiv. Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m2)
xv. Water Absorption (maximum) (ASTM D 570): 0.5 %
xvi. Methane Gas Permeability (ASTM D 1434): 1.6*10−6ft²/hr at 14.7 psia (4.12*10−7 cm²/sec at 1 atm)
xvii. Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.04 static 0.71 kinetic

xviii. Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.75 static 0.63 kinetic

C. Vapor Retarder
  1. SBS-Modified Bitumen:
    a. Soprema Colphene Flam 180
      i. Thickness: 140 mils (3.5 mm)
      ii. Width: 39.4 in (1 m)
      iii. Length: 32.8 ft (10 m)
      iv. Adhesion of Poured Concrete (ASTM D 903 modified): 19.6 lbf/in (3430 N/m)
      v. Puncture Resistance (ASTM E154): 311 lb (1383N)
      vi. Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)
      vii. Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)
      viii. Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)
      ix. Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %
      x. Low Temperature Flexibility (ASTM D 1970): Unaffected at -4ºF (-20°C)
      xi. Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)
      xii. Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9ºF (-23°C)
      xiii. Lap Peel Adhesion (ASTM D 1786): 7.7 lbf/in (1360 N/m)
      xiv. Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m2)
      xv. Water Absorption (maximum) (ASTM D 570): 0.5 %
      xvi. Methane Gas Permeability (ASTM D 1434): 1.6*$\mathbf{10-6}$ft²/hr at 14.7 psia (4.12*$\mathbf{10-7}$ cm²/sec at 1 atm)
      xvii. Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.04 static 0.71 kinetic
      xviii. Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.75 static 0.63 kinetic

D. Flashing Membrane
  1. Polymethacrylate Liquid-applied Flashing (PMA):
    a. Soprema Alsan RS 260 LO Flash System: Liquid-applied, catalyzed flashing membrane with an embedded polyester reinforcement fabric used for monolithic waterproofing flashing membranes.
      i. Soprema Alsan RS 260 LO Flash: Low odor, rapid curing, polymethacrylate (PMA) liquid resin.
        a) VOC Content: 0.5 g/L
        b) Color: White
      ii. Soprema Alsan RS Catalyst Powder: Reactive agent used to induce curing of PMA resin products.
      iii. Soprema Alsan RS Fleece: Woven polyester reinforcement used in PMA liquid membrane applications.
        a) Thickness: 30-40 mils (0.8-1 mm)
        b) Weights: 110 g/m^2
        c) Width: Size as required.
        d) Length: 164 ft (50 m)
  2. Polymethyl Methacrylate Liquid-applied Flashing (PMMA):
    a. Soprema Alsan RS 230 Flash System: Liquid-applied, catalyzed flashing membrane with an embedded polyester reinforcement fabric used for monolithic waterproofing flashing membranes.
      i. Soprema Alsan RS 230 Flash: Rapid curing, polymethyl methacrylate (PMMA) liquid resin with an embedded polyester reinforcement fabric used for monolithic blindside waterproofing flashing applications.
        a) VOC Content: 4.2 g/L
        b) Color: White
      ii. Soprema Alsan RS Catalyst Powder: Reactive agent used to induce curing of PMMA resin products.
      iii. Soprema Alsan RS Fleece: Woven polyester reinforcement used in PMMA liquid membrane applications.
        a) Thickness: 30-40 mils (0.8-1 mm)
        b) Weights: 110 g/m^2
        c) Width: Size as required.
        d) Length: 164 ft (50 m)
  3. Elastomeric Liquid-applied Flashing:
    a. Soprema Colphene Liquid Membrane Flashing System: Two-component elastomeric, solvent free liquid membrane reinforced with self-adhesive modified bitumen membrane.

i. Soprema Colphene Liquid Membrane: Two component, elastomeric, solvent free liquid used to flash blindside waterproofing penetrations.
ii. Soprema Colphene 3000: SBS-modified bitumen, self-adhesive membrane with release film on the bottom surface and a polyethylene woven composite facer used to reinforce Soprema Colphene Liquid Membrane.
a) Thickness: 60 mils (1.5 mm)
b) Width: 36 in (0.9 m)
c) Length: 61 ft (18.6 m)

4. Bitumen-Urethane Liquid-applied Flashing:
a. Soprema Alsan Flashing System: Liquid-applied, single-component, reinforced flashing membrane.
i. Soprema Alsan Flashing: Single-component, polyurethane-bitumen resin with polyester reinforcing fleece fabric fully embedded into the resin used to flash penetrations in blindside waterproofing applications.
a) Solids Content: 80%
b) Meets or exceeds ASTM C836.
ii. Alsan Polyfleece: Non-woven polyester reinforcement.

5. Polymethyl Methacrylate (PMMA) Detailing Flashing:
a. Soprema Alsan RS Detailer Flashing System: Rapid curing, catalyzed polymethyl methacrylate (PMMA) liquid resin with microfibers used as the waterproofing paste where it is difficult to install a conventional reinforced waterproofing membrane.
i. Soprema Alsan RS Detailer: Polymethyl methacrylate (PMMA) liquid resin with microfibers used as the waterproofing paste where it is difficult to install a conventional reinforced waterproofing membrane.
ii. Soprema Alsan RS Catalyst Powder: Reactive agent used to induce curing of PMMA resin products.

E. Drainage Mat:
1. Soprema Sopradrain 10-G: High density drainage mat with a non-woven, factory laminated geotextile fabric on the top side used to drain vertical and horizontal blindside waterproofing applications.
a. Width: 72 in (1.83 m)
b. Length: 50 ft (15.25 m)
c. Compressive Strength (kPa): 550 (11,000 psf)
2. Soprema Sopradrain ECO-2: Entangled polypropylene filament drainage mat with a geocomposite fabric on both sides used to drain vertical and horizontal blindside waterproofing applications.
a. Width: 39 in (1 m)
b. Length: 100 ft (30 m)
c. Compressive Strength: 1436 kPa (>30,000 psf)

F. Pre-applied Protection Board
1. Soprema Sopraboard: Mineral fortified, asphaltic roof substrate board with glass fiber facers. For use as a protection board on vertical and horizontal substrates in blindside waterproofing applications. Asphaltic Protection Board shall be manufactured by the membrane supplier.
a. Thickness: 1/4 in
b. Dimensions: 4 x 4 ft

G. Post Applied Protection Sheet
1. Soprema Colphene BSW Protect'r: SBS-modified bitumen, self-adhesive membrane with release film on the bottom surface and a sanded top surface used as a secondary protection on horizontal blindside waterproofing applications. Composite reinforcement.
a. Thickness: 80 mils (2.0 mm)
b. Width: 39.4 in (1 m)
c. Length: 49.2 ft (15 m)

2.4 ACCESSORIES

A. Primers:
1. Soprema Sopraseal Stick: Self-Adhered membrane primer. SBS polymer, resin and, solvent-based primer for the preparation of membrane substrates for self-adhered SBS membrane and self-adhered SBS flashing applications.

2. Soprema Elastocol Stick Zero: Zero VOC, self-adhesive membrane primer. Low VOC solvent-based primer for the preparation of membrane substrates for self-adhered SBS membrane and self-adhered SBS flashing applications.

B. Fasteners and Plates:
1. Soprema #12 DP Fastener and 3 in stress plate: Fastener and plate used to secure drainage mat to wood lagging.
2. Soprema #12 DP Fastener and 2 in stress plate: Fastener and plate used to secure vertical field membrane to wood lagging.
3. Waterstop: Bentonite/butyl-rubber waterstop, RX-101 rectangle, 1" x ¾", such as by Volclay, www.CETCO.com.

PART 3 – EXECUTION

3.1 EXECUTION

A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
B. The contractor shall examine all waterproofing substrates.
C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified waterproofing materials.
D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified waterproofing system.
E. No waterproofing membranes will be installed during rain or snowfall. Use of salt or calcium is prohibited to remove ice or snow.
F. Verify the compatibility of all membrane components with curing compounds, coatings or other materials which are already or will be installed on the surfaces to be treated.

3.2 PREPARATION

A. Before commencing work each day, the contractor shall prepare all waterproofing substrates to ensure conditions are satisfactory to proceed with the installation of specified waterproofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.3 DRAINAGE MAT APPLICATION

A. Drainage board must be supported and follow the shapes of the substrate.
B. Drainage board can bridge cracks and/or holes in the substrate from 1 to 2 in wide and deep. Cracks and/or holes in the substrate exceeding 2 in shall be prepared using mortar, shotcrete, plywood, Sopraboard (mechanically attached to substrate) or other approved method prior to the placement of the drainage board.
C. Install drainage mat in accordance with membrane manufacturer's published instructions.
D. Place and secure drainage mat with the filter fabric facing the positive side of the waterproofing. Overlap the edges of the geotextile fabric to maintain continuity.
E. For vertical applications, fasten drainage mat to substrate using appropriate fasteners and plates.
F. Ensure drainage panels are not damaged during subsequent construction.

3.4 PRE-APPLIED PROTECTION BOARD APPLICATION

A. Install protection board in accordance with manufacturer's published instructions.
B. Place and secure all boards fitted against adjoining boards to form tight joints.
C. For vertical applications, fasten and secure protection board to substrate using appropriate fasteners for the substrate.
D. Ensure protection board is not damaged during subsequent construction.

3.5 POST APPLIED PROTECTION SHEET APPLICATION

A. Follow material product data sheets and published general requirements for installation instructions.
B. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application of the self-adhesive membrane.
C. Ensure horizontal field membrane is prepared and acceptable to receive the self-adhesive membrane.
D. Unroll the protection sheet and loose lay in place.
E. Ensure minimum 1 in side and end-laps.
F. Adhere the protection sheet in a continuous longitudinal strip over the horizontal waterproofing membrane by removing the silicone release film.
G. As the release film is peeled away, use a stiff push broom or roller to firmly set the sheet in place. Ensure full contact is made between the ply and the substrate for full adhesion.
H. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight.
I. Inspect the installation each day to ensure the plies are fully adhered. Repair all un-adhered voids, wrinkles, open laps and all other deficiencies.
J. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs, prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged membrane.

3.6 PRIMER APPLICATION

A. Examine all substrates and conduct adhesion peel tests as necessary to ensure satisfactory adhesion is achieved.
B. Apply the specified self-adhesive primer to dry, compatible substrates where determined primer is necessary to enhance adhesion.
C. For the self-adhesive waterproofing applied during cold temperatures (below 50ºF) the specified self-adhesive primer shall be applied.
D. Apply primer using brush, roller, or sprayer at the rate published on the product data sheet.
E. Ensure self-adhered membrane primer is tacky to-the-touch, but not wet. Primer should not transfer to the finger tips when touched.
F. As project conditions vary throughout the day, applicator shall monitor changing conditions, monitor the drying time of primers, and monitor the adhesion of the membrane plies. Adjust primer and membrane application methods as necessary to achieve the desired results.

3.7 VERTICAL FIELD MEMBRANE APPLICATION (COLPHENE BSW V)

A. Follow material product data sheets and published general requirements for installation instructions.
B. Temporarily fasten the top leading edge of the waterproofing ply in place using specified fasteners and plates. Upon completion, remove and seal fastener holes using specified heat welded waterproofing membrane or specified liquid-applied flashing.
C. Vertical blind side waterproofing membrane shall be applied in lengths not exceeding 16 ft or as necessary to accommodate project conditions.
D. Once in place, remove the release film on the underside of the sheet.
E. As the release film is peeled away, use an approved membrane roller to roll-in vertical membrane to firmly set the sheet in place. Ensure full contact is made between the ply and the substrate for full adhesion.
F. Ensure a minimum 4 in side-lap is achieved.
G. The 4 in duo-selvage side-lap consists of 2 in of self-adhesive on the inside edge of the lap and 2 in of heat welded membrane along the outside edge of the side-lap.
H. Using a roller, seal the self-adhesive portion of the side-lap, and use an approved roofing torch or hot-air welder to seal the 2 in heat welded portion of the side lap.
I. All waterproofing end-laps shall be overlapped 6 in and fully adhered by heat welding.
J. All end lap joints shall be aligned and overlapped a minimum of 6 in beyond all fastener penetrations and holes where fasteners were removed.
K. Ensure all membrane T-joints are heat welded and fully sealed.
L. Waterproofing over concrete cold joints shall be reinforced by installing an additional 12 in reinforcing ply of membrane over the cold joint, fully heat-welded or self-adhered over primed surface. The waterproofing reinforcing ply shall be centered in the angle of the cold joint or over the cold joint.
M. All waterproofing membrane tie-ins shall be heat-welded to the adjacent ply.

N. If a negative/back-water lap is created on the positive side of the waterproofing, heat weld or self-adhere a reinforcing ply to strip-in the end-lap joint. The reinforcing ply shall extend a minimum of 4 in beyond the joint in both directions.
O. Each day, the contractor shall physically inspect all side and end-laps, and ensure the membrane is fully sealed watertight.
P. Inspect the installation each day to ensure the plies are secure and adhered.
Q. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs, prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged membrane.

3.8 VERTICAL FIELD MEMBRANE APPLICATION (COLPHENE BSW H)

A. Follow material product data sheets and published general requirements for installation instructions.
B. Temporarily fasten the top leading edge of the waterproofing ply in place using specified fasteners and plates. Upon completion, remove seal and fastener holes using specified heat welded waterproofing membrane or specified liquid-applied flashing.
C. Vertical blind side waterproofing membrane shall be applied in lengths not exceeding 16 ft or as necessary to accommodate project conditions.
D. Ensure a minimum 4 in side-lap is achieved.
E. The 4 in duo-selvage side-lap consists of 2 in of self-adhesive on the inside edge of the lap and 2 in of heat welded membrane along the outside edge of the side-lap.
F. Remove the side-lap release film, and use a roller to seal the self-adhesive portion of the side-lap. Use an approved roofing torch or hot-air welder to seal the 2 in heat welded portion of the side lap.
G. All end lap joints shall be aligned and overlapped a minimum of 6 in beyond all fastener penetrations and holes where fasteners were removed.
H. Waterproofing over concrete cold joints shall be reinforced by installing an additional 12 in reinforcing ply of membrane over the cold joint, fully heat-welded or self-adhered over primed surface. The waterproofing reinforcing ply shall be centered in the angle of the cold joint or over the cold joint.
I. All waterproofing membrane tie-ins shall be heat-welded to the adjacent ply.
J. If a negative/back-water lap is created on the positive side of the waterproofing, heat weld or self-adhere a reinforcing ply to strip-in the end-lap joint. The reinforcing ply shall extend a minimum of 4 in beyond the joint in both directions.
K. Each day, the contractor shall physically inspect all side and end-laps, and ensure the membrane is fully sealed watertight.
L. Inspect the installation each day to ensure the plies are secure and adhered.
M. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs, prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged membrane.

3.9 HORIZONTAL FIELD MEMBRANE APPLICATION (COLPHENE BSW H)

A. Follow material product data sheets and published general requirements for installation instructions.
B. Unroll horizontal blind side waterproofing membrane loose-laid onto the prepared substrate, or onto specified drainage mat/protection board where applicable per design requirements.
C. The 4 in duo-selvage side-lap consists of 2 in of self-adhesive on the inside edge of the lap and 2 in of heat welded membrane along the outside edge of the side-lap.
D. Remove the side-lap release film, and use a roller to seal the self-adhesive portion of the side-lap. Use an approved roofing torch or hot-air welder to seal the 2 in heat welded portion of the side lap.
E. All end lap joints shall be overlapped a minimum of 6 in.
F. End-laps shall be staggered 12 in or more. Where T-joints are formed at the end-laps, cut away a 4 in corner at a 45º angle from the overlying end--lap.
G. Waterproofing over concrete cold joints shall be reinforced by installing an additional 12 in reinforcing ply of membrane over the cold joint, fully heat-welded or self-adhered over primed surface. The waterproofing reinforcing ply shall be centered in the angle of the cold joint or over the cold joint.
H. All waterproofing membrane tie-ins shall be heat-welded to the adjacent ply.
I. Each day, the contractor shall physically inspect all side and end-laps, and ensure the membrane is fully sealed watertight.

J. Inspect the installation each day to ensure the plies are secure and adhered.
K. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs, prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged membrane.

3.10 LIQUID-APPLIED FLASHING, (PMA MEMBRANE APPLICATION) (ALSAN RS 260 LO FLASH)

A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
B. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
C. Apply the base coat of catalyzed liquid resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.
D. Immediately apply the reinforcing fleece into the wet base coat of resin. Using a brush or roller, work the reinforcing fabric into the wet resin while applying the second coat of catalyzed liquid resin to completely encapsulate the fleece.
E. Refer to reinforced, polymethacrylate (PMA) specification section and application instructions, details drawings, product data sheets and published general requirements for installation instructions.

3.11 LIQUID-APPLIED FLASHING, (PMMA MEMBRANE APPLICATION) (ALSAN 230 FLASH)

A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
B. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
C. Apply the base coat of catalyzed liquid resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.
D. Immediately apply the reinforcing fleece into the wet base coat of resin. Using a brush or roller, work the reinforcing fabric into the wet resin while applying the second coat of catalyzed liquid resin to completely encapsulate the fleece.
E. Refer to reinforced, polymethyl-methacrylate (PMMA) specification section and application instructions, details drawings, product data sheets and published general requirements for installation instructions.

3.12 LIQUID-APPLIED FLASHING, (ELASTOMERIC LIQUID MEMBRANE APPLICATION) (COLPHENE LIQUID MEMBRANE)

A. Refer to manufacturer's detail drawings, product data sheets and published general requirements for application rates and specific installation instructions.
B. Dispense the liquid-applied membrane from 2-component cartridge onto the substrate, then evenly apply over the work area using a trowel.
C. Remove release film from Colphene 3000 and apply over the wet Colphene iquid Membrane immediately before the liquid skins over.
D. For pipe penetrations and similar round details, secure a stainless steel pipe clamp around top leading edge of the reinforced liquid flashing before Colphene Liquid Membrane has cured.

3.13 LIQUID-APPLIED FLASHING, (BITUMEN-URETHANE MEMBRANE APPLICATION) (ALSAN FLASHING)

A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
B. Pre-cut Colphene BSW H to conform to penetration.
C. Field-wrap and heat weld Colphene BSW H to completely flash and seal the penetration watertight.
D. Apply reinforced Alsan Flashing over Colphene BSW H to fully encapsulate and seal the penetration.

1. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
2. Apply the base coat of liquid resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion at 2.0 gallons per square.
3. Immediately apply the reinforcing fleece into the wet base coat of resin. Using a brush or roller, work the fleece into the wet resin while applying the second coat of liquid resin to completely encapsulate the fleece at 2.0 gallons per square, and extend the liquid resin 1 inch beyond the fleece.
4. Allow the liquid membrane to sufficiently cure for 24 to 48 hours then apply the finish coat of liquid resin at 2.0 gallons per square.

E. Pre-cut Colphene BSW V and remove the self-adhesive release film.
F. Ensure Alsan flashing has cured then wrap the pipe with the Colphene BSW V.
G. Secure a stainless steel pipe clamp around the Colphene BSW V.

3.14 CLEAN-UP

A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION

SECTION 07 18 16

VEHICULAR TRAFFIC COATINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes traffic coatings and pavement markings for the following applications:
   1. Vehicular traffic.
B. Related Requirements:
   1. Section 03 30 00 "Cast-In-Place Concrete" for surface finish of substrate to receive traffic coating.

1.3 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including installation instructions.
B. Shop Drawings: For traffic coatings.
   1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
   2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Certificates: For each type of traffic coating.
C. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
   1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.
B. Do not install traffic coating until items that penetrate membrane have been installed.
C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials or 50 deg F for water-based materials, and not exceeding 95 deg F.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Adhesive or cohesive failures.
      b. Abrasion or tearing failures.
      c. Surface crazing or spalling.
      d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
B. Source Limitations:
   1. Obtain traffic coatings from single source from single manufacturer.
   2. Obtain primary traffic-coating materials, including primers, from traffic-coating manufacturer. Obtain accessory materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of types and from sources recommended in writing by primary material manufacturer.
   3. Obtain pavement-marking paint from single source from single manufacturer.

2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for vehicular traffic; according to ASTM C 957.
   1. Traffic Coating – Car Stall:
   2. Traffic Coating – Drive Lanes:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Advanced Polymer Technology Corporation.

2. BASF Corporation; Construction Systems.
3. Neogard; a division of Jones-Blair, Inc.
4. Tremco Incorporated.
5. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

C. Primer: Liquid waterborne or solvent-borne primer recommended for substrate and conditions by traffic coating manufacturer.
1. Material: Epoxy.

D. Preparatory and Base Coats: epoxy.
1. Thicknesses: Minimum dry or wet film thickness as recommended in writing by manufacturer for substrate and service conditions indicated.

E. Intermediate Coat: Polyurethane.
1. Thicknesses: Minimum dry or wet film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.
2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.

F. Topcoat: Polyurethane.
1. Thicknesses: Minimum dry or wet film thickness as recommended in writing by manufacturer for substrate and service conditions indicated, measured excluding aggregate.
2. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated and as required to achieve slip-resistant finish .
3. Color: As selected by Architect from manufacturer's full range.

G. Aggregate: Manufacturer's standard aggregate for each use indicated of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.

H. Concrete Sealer: Floor concrete sealer at level U4.
1. Silane and siloxane product chemistry developed to penetrate concrete surfaces to repel water and liquids.
2. Basis of Design: Chemstop WB Regular as manufactured by Euclid Chemical Co.
3. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.3 ACCESSORY MATERIALS

A. Joint Sealants: As specified in Section 07 92 00 "Joint Sealants."

B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.
1. Thickness: Minimum 60 mils.

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

2.4 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than [three][45] minutes.
1. Color: As indicated.

B. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.
1. Color: As indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of traffic-coating work.

B. Verify that substrates are visibly dry and free of moisture.
1. Test for moisture according to ASTM D 4263.
2. Test for moisture content by method recommended in writing by traffic-coating manufacturer.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of traffic-coating work.
D. Proceed with installation only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
   1. Begin coating application only after minimum concrete-curing and -drying period recommended in writing by traffic-coating manufacturer has passed and after substrates are dry.
   2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. General: Before applying traffic coatings, clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application. Remove projections, fill voids, and seal joints if any, as recommended in writing by traffic-coating manufacturer.
B. Schedule preparation work so dust and other contaminants from process do not fall on wet, newly coated surfaces.
C. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.
D. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.
   1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
   2. Remove concrete fins, ridges, and other projections.
   3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
   4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.
B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.
C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.
D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.
B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.5 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.
B. Start traffic-coating application in presence of manufacturer's technical representative.
C. Verify that wet film thickness of each coat complies with requirements every 100 sq. ft..
D. Uniformly broadcast aggregate on coats specified to receive aggregate. Embed aggregate according to manufacturer's written instructions. After coat dries, sweep away excess aggregate.
E. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.
F. Cure traffic coatings. Prevent contamination and damage during application and curing stages.

G. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.
   1. Traffic Coating – Car Stall:
   2. Traffic Coating – Drive Lanes:

3.6 PAVEMENT MARKINGS

A. Do not apply pavement-marking paint for striping and other markings until layout, colors, and placement have been verified with Architect and traffic coating has cured.
B. Sweep and clean surface to eliminate loose material and dust.
C. Apply pavement-marking paint with mechanical equipment to produce markings of dimensions indicated with uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil-minimum, wet film thickness.
   1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform the following field tests and inspections:
   1. Materials Testing:
      a. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of [Owner and] Contractor.
      b. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures.
      c. Testing agency shall verify thickness of coatings during traffic-coating application for each [600 sq. ft.] <Insert dimension> of installed traffic coating or part thereof.
   2. If test results show traffic coating does not comply with requirements, remove and replace or repair the membrane as recommended in writing by traffic-coating manufacturer and make further repairs after retesting until traffic-coating installation passes.
B. Final Traffic-Coating Inspection: Arrange for traffic-coating manufacturer's technical personnel to inspect membrane installation on completion.
   1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
D. Prepare test and inspection reports.

3.8 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.
B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

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SECTION 07 19 00
WATER REPELLENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes film-forming water-repellent treatments for the following vertical and horizontal surfaces:
   1. Concrete unit masonry.
   2. Natural stone.

B. Related Requirements:
   1. Section 03 01 30 "Maintenance of Cast-in-Place Concrete" for high-build penetrating polymer sealers for exterior traffic surfaces.
   2. Section 04 22 00 "Concrete Unit Masonry" for integral water-repellent admixture for unit masonry assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's printed statement of VOC content.
   2. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of water repellent.

B. Preconstruction Test Reports: For water-repellent-treated substrates.

C. Sample Warranty: For special warranty.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on field mockups.
   1. Test a minimum 4 ft. by 4 ft. area on each type of masonry. Use the manufacturer's application instructions. Let test area protective treatment cure before inspection. Keep test panels available for comparison throughout the protective treatment project.
   2. In addition to verifying performance requirements, use mockups to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrates.
   3. Propose changes to materials and methods to suit Project.
   4. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.7 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:
   1. Concrete surfaces and mortar have cured for not less than 28 days.
   2. Building has been closed in for not less than 30 days before treating wall assemblies.
   3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
   4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
   5. Rain or snow is not predicted within 24 hours.
   6. Not less than 2 hours have passed since surfaces were last wet.
   7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Applicator agree(s) to repair or replace materials that fail to maintain water repellency and graffiti protection within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 WATER REPELLENTS

A. High performance, clear, solvent-based silicone elastomer formulated to weatherproof concrete block and other porous masonry materials and protect treated surfaces from repeated graffiti attacks with little to no change to the natural appearance.
   1. Applied with low-pressure spray, brush or roller, product penetrates and fills pores to prevent water penetration through exterior walls exposed to normal weathering. Graffiti removal is achieved using Defacer Eraser® Graffiti Wipe.
   2. Basis of Design: Subject to compliance with requirements, provide the following product that may be incorporated into the Work, but are not limited to, the following:
      a. Sure Klean® Weather Seal Blok-Guard® & Graffiti Control Ultra 15.
   3. Blok-Lok with Graffiti Control by Rain Guard, 21622 Surveyor Circle, Huntington Beach, CA 92646; Tel: (949) 515-8800; Website: www.rainguardpro.com.
   4. Protectosil Anti-Graffiti by Evonik Industries, 299 Jefferson Road, Parsippany, NJ 07054; Tel: (800) 828-0919; Website: www.protectosil.com.
   5. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. Technical Properties:
   1. Form: Clear liquid, petroleum odor.
   2. Specific Gravity: 1.28.
   3. pH: not applicable.
   4. Weight/Gallon: 10.62 pounds.
   5. Active Content: 15 percent.
   6. Total Solids: 15 percent ASTM D2369.

7. Voc Content: less than 100 grams per Liter.
8. Flash Point: 100 degrees F (38 degrees C) ASTM D3278.
9. Freeze Point: less than -22 degrees F (less than -30 degrees C).
10. Shelf Life: 1 year in tightly sealed, unopened container.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.
   1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
   2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
   3. Verify that required repairs are complete, cured, and dry before applying water repellent.

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

3.2 PREPARATION

A. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions and as follows:
   1. Concrete Unit Masonry: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857.
   2. Natural Stone: As recommended by stone supplier.

B. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet for Weather Seal Blok-Guard® & Graffiti Control Ultra 15. Refer to the Product Data Sheet for additional information about application of Blok-Guard® & Graffiti Control Ultra 15. Do not dilute or alter. Stir thoroughly before use. Once opened, Blok-Guard® & Graffiti Control Ultra 15 must be used immediately.

C. Sprayer Application Instructions
   1. Using low-pressure (less than 50 psi) spray equipment, saturate, “wet-on-wet” from the bottom up. Avoid excessive overlapping.
   2. Let the first application penetrate the masonry surface for 2 to 3 minutes.
   3. Immediately brush out runs and drips to prevent build up.

D. Brush or Roller Application Instructions
   1. Thoroughly saturate the surface. Avoid excessive overlapping. Brush out runs and drip to prevent buildup.

E. Heavily Textured and Porous Surface Application Instructions
   1. Using low-pressure (less than 50 psi) spray equipment, saturate, “wet-on-wet” from the bottom up, applying enough material to create a 6 to 8 inch rundown below the contact point while avoiding excessive overlapping. Let the first application penetrate the masonry surface for 2 to 3 minutes. Reapply in the same saturating manner to ensure complete coverage of recessed surfaces. Immediately brush out runs and rips to prevent build up.

F. Dense, Smooth Surface Application Instructions
   1. Apply enough in a single saturating application to completely wet the surface without creating drips, puddles or rundown. Brush out or back roll all runs and drips for uniform appearance. DO NOT OVER APPLY. One application is normally enough.

G. Second Coat Application Instructions
   1. Apply the second coat as soon as the first coat is dry to touch, or within 2 hours of the first coat. Immediately back roll or brush out runs and drips for a uniform appearance and to prevent build up. Allowing more than 2 hours between coats reduces effectiveness of the second coat.

H. Drying Time: Protect treated surfaces from rain for 4 to 6 hours. In normal weather (60 to 80 degrees Fahrenheit at 50 percent humidity), Blok-Guard® & Graffiti Control Ultra 15 dries to the touch in about 25 minutes. Drying takes lower at lower temperatures. Product gains its water-repellency properties in 24 hours.

I. Graffiti Removal: Remove most types of graffiti with Defacer Eraser® Graffiti Wipe or Enviro Klean ® SafStrip.

J. Clean-up: clean tools and equipment immediately with mineral spirits or an equivalent cleaning solvent. Remove over spray and spills as soon as possible.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Mineral-wool blanket.
   2. Mineral-wool board.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.
B. Research reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 – PRODUCTS

2.1 MINERAL WOOL BLANKETS

A. Recycled Content: Postconsumer recycled content plus one-half of Pre-consumer recycled content not less than 35 percent. Pre-consumer = 70%. Post-consumer = 0%.
B. Mineral-Wool Blanket, Kraft faced: ASTM C 665, Type II (blankets kraft- faced product facing); 1 consisting of fibers; with Class C Membrane-faced surface not rated for flame propagation resistance (for use In non-exposed applications only).
   1. Category 1 Membrane is a vapor retarder. Where indicated or required.
   2. Category 2 Membrane is not a vapor retarder. Where indicated or required.
   3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Industrial Insulation Group, LLC (IIG-LLC).
      b. Roxul Inc.
      c. Thermafiber Inc.; an Owens Corning company.

2.2 MINERAL WOOL BOARD

A. Recycled Content: Postconsumer recycled content plus one-half of Pre-consumer recycled content not less than 35 percent. Pre-consumer = 70%. Post-consumer = 0%.
B. Mineral-Wool Board, Kraft faced: ASTM C 665, Type II (kraft- faced product facing); consisting of fibers; with Class C Membrane-faced surface not rated for flame propagation resistance (for use In non-exposed applications only).
   1. Category 1 Membrane is a vapor retarder. Where indicated or required.
   2. Category 2 Membrane is not a vapor retarder. Where indicated or required.
   3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Industrial Insulation Group, LLC (IIG-LLC).
      b. Roxul Inc.
      c. Thermafiber, Inc.; an Owens Corning company.

2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke developed indexes of 5, per ASTM E 84.
   2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 – EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.
B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

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SECTION 07 21 29

SPRAYED CELLULOSE THERMAL INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Sprayed cellulose thermal insulation.
B. Related Requirements:
   1. Section 07 21 00 "Thermal Insulation" for foamed in place insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Manufacturer's Written Certification:
   1. Product contains no asbestos, fiberglass or other man-made mineral fibers.
   2. Recycled Content: Minimum fiber recycled content shall no less than 75%.
   3. Materials shall not contain any added Urea-Formaldehyde Resins.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Manufacturer shall have a current Underwriters Laboratories (UL) Code Evaluation Report.
B. Manufacturer shall be in compliance with the 2009 and 2012 International Building Code.
C. Manufacturer shall subscribe to independent laboratory follow-up inspection services of Underwriters Laboratories and Factory Mutual. Each bag shall be labeled accordingly.
D. Applicator: Licensed by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver in original, unopened containers bearing name of manufacturer, product identification and reference to U.L. testing.
B. Store materials dry, off ground, and under cover.
C. Protect liquid adhesive from freezing.
D. Water to be potable.

PART 2 – PRODUCTS

2.1 SPRAY-ON SYSTEM

A. Performance:
   1. Bond strength shall be greater than 100 psf per ASTM E 736.
   2. Product shall be Class 1 Class A per ASTM E 84/ UL 723.
   3. Non-corrosive per ASTM C 739.
   4. Bond Deflection per ASTM E 759: 6" Deflection in 10' Span – No Spalling or Delamination.
   5. R-Value shall be 3.75 per inch per ASTM C518.
   6. Comply with IBC 803.3/2009 IBC 803.10 stability requirements for interior finishes.
   7. Meet ASTM C 1149.
B. Basis-of-Design Product: Subject to compliance with requirements, provide International Cellulose Corporation - K-13 Spray-On-Systems or comparable product by one of the following:
   1. Applegate Insulation.
   2. ThermoCon spray-applied insulation.
   3. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
C. Material:
   1. Color shall be from Manufacturer's standard color chart.
   2. Comply with local Building Code requirements.
   3. Material shall have been tested in accordance with ASTM E 1042. Testing laboratory shall be NVLAP accredited.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces and report unsatisfactory conditions in writing. Do not proceed until unsatisfactory conditions are corrected.
B. Verify surfaces to receive spray insulation to determine if priming/sealing is required to insure bonding and/or to prevent discoloration caused by migratory stains.

3.2 PREPARATION

A. Clips, hangers, supports, sleeves and other attachments to spray bases are to be placed by other trades prior to the application of sprayed insulation.
B. Ducts, piping, conduit or other suspended equipment shall not be positioned until after the application of sprayed insulation.
C. Provide masking, drop cloths or other satisfactory coverings for materials/surfaces that are not to receive insulation to protect from over-spray.
D. Coordinate installation of the sprayed cellulose fiber with work of other trades.
E. Prime surfaces as required by manufacturer's instructions or as determined by examination.

3.3 INSTALLATION

A. Install spray applied insulation to achieve an average NRC as indicated on the Material Tag Index.
B. Cure insulation with continuous natural or mechanical ventilation.
C. Remove and dispose of over-spray.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION

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SECTION 07 24 19
EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 – GENERAL

1.1 SUMMARY

A. Commercial Exterior Insulation and Finish System with an Air and Water-Resistive Barrier Coating and a Means of Positive Moisture Drainage.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.3 PERFORMANCE REQUIREMENTS

A. Exterior Insulation and Finish System (EIFS):
   1. Air/Water-Resistive Barrier Coating - System Construction:
      a. Tensile Bond ASTM C 297/E 2134: Minimum 104 kPa (15 psi).
      b. Freeze-thaw ASTM E 2485: No deleterious effects after 10 cycles.
      c. Water Resistance ASTM D 2247: No deleterious effects after 14 days exposure.
      d. Water Vapor Transmission ASTM E 96 Proc. B: Vapor Permeable.
      e. Air Leakage ASTM E 283: 0.6 l/min/m2 (0.002 cfm/sq ft).
      f. Air Permeance ASTM E 2178: 0.0006 l/s/m2 @ 75Pa (1.2x10-4 cfm/ft2 @ 1.6 psf) (Backstop NT)
      g. Air Barrier Assembly ASTM E 2357: 0.05 l/sec m2 @300 Pa (<0.001 cfm/ft2 @ 6.24 psf) (Backstop NT)
      h. Structural Performance ASTM E 1233 Proc. A: Minimum 10 positive cycles at 1/240 deflection; No cracking in field, at joints or interface with flashing.
      i. Racking ASTM E 72: No cracking in field, at joints or interface with flashing at net deflection of 3.2 mm (1/8 inch).
      j. Restrained Environmental: 5 cycles; No cracking in field, at joints or interface with flashing.
      k. Water Penetration ASTM E 331: No water penetration beyond the inner-most plane of the wall after 15 minutes at 137 Pa (2.86 psf).
      l. UV Exposure ASTM D 2898: 210 hours of exposure.
      m. Accelerated Aging: 25 cycles of drying and soaking.
      n. Hydrostatic Pressure Test AATCC 127: 21.6-inch water column for 5 hours.

o. Surface Burning Characteristics ASTM E 84: Flame Spread - Less Than 25; Smoke Developed - Less than 450.

2. Durability - System Construction:
   a. Abrasion Resistance ASTM D 968: No deleterious effects after 1000 liters (1056 quarts).
   b. Accelerated Weathering ASTM G155 Cycle 1: No deleterious effects after 5000 hours.
   c. Accelerated Weathering ASTM G 154 Cycle 1 (QUV): No deleterious effects after 5000 hours.
   d. Freeze-Thaw ASTM E 2485: No deleterious effects after 90 cycles.
   e. Mildew Resistance ASTM D 3273: No growth during 60-day exposure period.
   f. Water Resistance ASTM D 2247: No deleterious effects after 42 days exposure.
   g. Taber Abrasion ASTM D 4060: Passed 1000 cycles.
   h. Salt Spray Resistance ASTM B 117: No deleterious effects after 1000 hours exposure.
   i. Water Penetration ASTM E 331: Passed 15 minutes at 137 Pa (2.86 psf).
   j. Water Vapor Transmission ASTM E 96 Proc. B.
      i. EPS: 5 Perm-inch.
      ii. Base Coat: 40 Perms.
      iii. Finish: 40 Perms.
   k. Drainage Efficiency ASTM E 2273: Minimum Drainage Efficiency of 90 percent.
3. Structural
   a. Tensile Bond ASTM C 297/E 2134: Minimum 104 kPa (15 psi) - substrate or insulation failure.
   b. Transverse Wind Load ASTM E 330: Withstand positive and negative wind loads as specified by the building code. Minimum 4.3 kPa (90 psf) 16-inch o.c. framing, 1/2-inch sheathing screw attached at 203 mm (8 inch) o.c. (For higher wind loads contact Dryvit Systems, Inc.)
4. Impact Resistance: In accordance with ASTM E 2486 (formerly EIMA Standard 101.86):
   a. Standard - 146 g/m2(4.3 oz/yd2), Minimum Tensile Strength 27 g/cm (150 lbs/in). EIMA Impact Classification - Standard. EIMA Impact Range 3-6 Joules (25-49 in-lbs).
   b. Standard Plus - 203 g/m2(6 oz/yd2), Minimum Tensile Strength 36 g/cm (200 lbs/in). EIMA Impact Classification - Medium. EIMA Impact Range 6-10 Joules (50-89 in-lbs).
   c. Intermediate - 407 g/m2(12 oz/yd2), Minimum Tensile Strength 54 g/cm (300 lbs/in). EIMA Impact Classification - High. 10-17 Joules (90-150 in-lbs).
   d. Panzer 15 - 509 g/m2(15 oz/yd2), Minimum Tensile Strength 71 g/cm (400 lbs/in). EIMA Impact Classification - Ultra High. >17 Joules (>150 in-lbs). Used in conjunction with standard mesh.
   e. Panzer 20 - 695 g/m2(20.5 oz/yd2), Minimum Tensile Strength 98 g/cm (550 lbs/in). EIMA Impact Classification - Ultra High. >17 Joules (>150 in-lbs). Used in conjunction with standard mesh.
   f. Detail Short Rolls - 146 g/m2(4.3 oz/yd2), Minimum Tensile Strength 27 g/cm (150 lbs/in).
   g. Corner Mesh - 244 g/m2(7.2 oz/yd2), Minimum Tensile Strength 49 g/cm (274 lbs/in).
5. Fire Performance:
   a. Fire Resistance (ASTM E 119): Passed 1 hour.
   b. Ignitability (NFPA 268): No ignition at 12.5 kw/m2 at 20 minutes.
   c. Intermediate Multi-Story Fire Test (NFPA 285):
      i. Resist flame propagation over the exterior surface.
      ii. Resist vertical spread of flame within combustible core/component of panel from one story to the next.
      iii. Resist vertical spread of flame over the interior surface from one story to the next.
      iv. Resist lateral spread of flame from the compartment of fire origin to adjacent spaces.
   d. Full Scale Multi-Story with Dryvit FM products (corner test) ASTM E 84. Flame Spread - Less Than 25; Smoke Developed - Less than 450.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Submit Manufacturer's drawings detailing the approved methods for flashing and waterproofing all conditions applicable to the work listed in this section.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
F. Closeout Submittals: Provide manufacturer's moisture drainage and limited materials warranty against defective material.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide all products specified in this section by a single manufacturer with a minimum of ten years experience.
B. Installer Qualifications: Install all products listed in this section by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of hazardous materials in accordance with requirements of local authorities having jurisdiction.

1.7 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Dryvit Systems, Inc.
   2. Finestone BASF Wall Systems
   3. Parex
   4. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 EXTERIOR INSULATION AND FINISH SYSTEM

A. Basis of Design: Dryvit Outsulation MD System Exterior Insulation and Finish System (EIFS), Class PB, in accordance with Dryvit Systems Inc. Provide the system complete including a water resistive barrier coating (air/water-resistive barrier), an adhesive, grooved expanded polystyrene insulation board, internal vinyl tracks (Dryvit Track and Vent Track), Dryvit Vent Assembly, Dryvit Starter Strip, base coat, reinforcing mesh and finish.
   1. Methods of Installation:
      a. Field Applied: Applied to the substrate system in place.
   2. Design Requirements:
      a. Deflection of the substrate systems shall not exceed 1/240 times the span.
      b. Substrate shall be flat within 6.4 mm (1/4 inches) in a 1.2 m (4 foot) radius.
      c. Slope of inclined surfaces shall not be less than 6:12, and the length shall not exceed 305 mm (12 inches).
      d. Expansion Joints: Provide expansion joints where indicated on the Drawings. As a minimum, expansion joints shall be placed at the following locations:
         i. Where expansion joints occur in the substrate system.
         ii. Where building expansion joints occur.
         iii. Where the EIFS System abuts dissimilar materials.
      e. Terminations:

i. Prior to applying EIFS System, treat wall openings with flashing Tape.
ii. EIFS System shall be held back from adjoining materials around openings and penetrations such as windows, doors, and mechanical equipment a minimum of 19 mm (3/4 inch) for sealant application.
iii. Terminate the system ta minimum of 203 mm (8 inches) above finished grade.
iv. Sealants: Sealants shall be compatible with the EIFS System materials.

f. Vapor Retarders: Provide vapor retarders within a wall assembly as indicated on the Drawings and in conformance with local building code requirements.
g. Flashing: Provide at all roof-wall intersections, windows, doors, chimneys, decks, balconies and other areas as necessary to prevent water from entering behind the EIFS System.

2.3 FINISH COAT

A. Standard DPR (Dirt Pickup Resistance) Finish: 100 percent acrylic-based coating offered in standard and custom colors. The finishing touch that adds lasting color and texture to exterior and interior walls.
1. Color: To be selected by the Architect from Manufacturer's available color choices.
2. Texture: Sandpebble Fine DPR.
3. Performance:
a. Water Vapor Transmission: ASTM E 96 - Permeable to water vapor.
b. Water Resistance: ASTM D 2247 - 42-day exposure; No deleterious effects.
c. Salt Spray Resistance: ASTM B 117 - 1000 hours; No deleterious effects.
d. Accelerated Weathering: ASTM G 155 - 5000 hours; No deleterious effects.
e. Mildew Resistance: ASTM D 3273 - 60 Days, no growth.
f. Flame Spread: ASTM E 84 - Less than 25, Class I.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. Verify that the substrate is:
1. Acceptable for use in conjunction with the work listed in this section.
2. Flat within 6.4 mm (1/4 inch) in a 1.2 m (4 foot) radius.
3. Sound and dry with tight connections, no surface voids, projections, or other conditions that may interfere with the EIFS System installation or performance.
C. Install all flashings and other waterproofing details prior to commencing work.
1. Inspect metal roof flashing for installation in accordance with Asphalt Roofing Manufacturers Association (ARMA) Standards.
2. Flash openings in accordance with the Contract Drawings or as otherwise necessary to prevent water penetration.
3. Flash all chimneys, balconies and decks and other adjacent work.
4. Install all windows, doors and other surface penetrations in accordance with manufacturer's requirements and the Contract Drawings.
D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Protect adjoining work and property during installation
B. Remove foreign materials from all substrates, such as oil, dust, dirt, form-release agents, efflorescence, paint, wax, water repellants, moisture, frost, and any other condition that may inhibit adhesion.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions as follows.

B. Apply base coat sufficiently to fully embed the mesh. The recommended method is to apply the base coat in two passes.
C. Coat EIFS System surfaces in contact with textured finishes or base coat surfaces with Demandit or Color Prime.
D. Install high impact meshes as specified at ground level, high traffic areas and other areas exposed to or susceptible to impact damage.
E. Protect EIFS System materials from inclement weather and other sources of damage until completely dry.

3.4 CLEANING

A. Remove all excess materials shall be removed from the job site in accordance with contract provisions and as required by applicable law.
B. Clean debris and foreign substances resulting from the contractor's work from all surrounding areas.

3.5 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 07 27 15.13

NON-BITUMINOUS SELF-ADHERING SHEET AIR BARRIERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Self-adhering, vapor-permeable, non-bituminous sheet air barriers.
B. Related Requirements:
   1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
   2. Section 07 42 13.16 “Metal Plate Wall Panels” for the weather barrier envelope system.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

C. Sustainable Design Submittals:
1. Product Certificates: For regional materials, indicating location of material manufacturer 1 and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. 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 air barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
1. Submit documentation from an approved independent testing laboratory certifying compliance with:
a. The air leakage rates of the air barrier membrane assembly, including primary membrane, primer and sealants have been tested to meet ASTM E2357.
b. ICC-AC 38.
c. Peel adhesion to unprimed plywood and cyclic and elongation per ICC-AC 48.
d. Class A flame spread index and smoke development per ASTM E-84.
2. Submit documentation from an approved independent testing laboratory certifying the air leakage and vapor permeance rates of the air barrier membrane, including primary membrane and transition sheets, exceed the requirements of the Massachusetts Energy Code and in accordance with ASTM E2178.
a. Test report submittals shall include test results of sustained wind loads and gust load air leakage results.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 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.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.10 WARRANTY

A. Provide manufacturer’s published 12-year material warranty for air barrier membrane materials, sealant and flashing membrane.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 NON-BITUMINOUS SHEET AIR BARRIER (AB-2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide BlueskinVP 160 manufactured by Henry. or comparable product by one of the following:
   1. Tremco, Inc., ExoAir 111.
   2. Carlisle Coatings & Waterproofing Inc.
   3. Cosella-Dörken Products, Inc.
   4. GCP Applied Technologies Inc. (formerly Grace Construction Products).
   5. VaproShield LLC.
   6. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. Nominal 23-mil- (0.58 mm-) thick, self-adhering sheet consisting of a breathable carrier film or fabric and an adhesive with release liner on adhesive side and formulated for application with primer that complies with VOC limits.

C. Physical and Performance Properties:
   1. Air leakage: <0.004 CFM/ft2 @ 1.57 lbs/ft2 when tested in accordance with ASTM E2178,
   2. Water Vapor Permeance: 29 perms to ASTM E96, Method B,
   3. Tested to ASTM E2357 for Air Leakage of Air Barrier Assemblies,
   4. Resistance to Water Penetration: Pass ICC-ES AC 38
   5. Water Penetration Resistance around Nails: Pass when tested to AAMA 711-05 & ASTM D 1970 modified,
   6. Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84: Flame Spread Rating of 0 and Smoke Development Classification of 105,
   7. Basis Weight: Minimum 160 gm/m2, when tested in accordance with TAPPI Test Method T-410,
   8. Tensile Strength: 40 lbF MD and 29 lbF CD per ASTM D828,
   9. Average Dry Breaking Force: 127 lbF MD, and 91 lbF CD per ASTM D 5034,
   10. Cyclic and Elongation: Pass at 100 cycles, -29 degrees C (-20 degrees F) per ICC-ES AC 48.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air barrier material and adjacent construction to which they may seal.

B. Self-adhering membrane for window sill pan flashings shall be Blueskin□SA, LT, or HT manufactured by Henry; an SBS modified bitumen, self-adhering sheet membrane which is integrally laminated to a blue polyethylene film. Membrane shall have the following physical properties:

C. Self-adhering membrane for all window jambs, headers, door openings, inside and outside corners, and other transitions shall be pre-cut BlueskinVPTM 160 manufactured by Henry; a self-adhering sheet air barrier membrane with an engineered film specifically designed to be water resistant and vapor permeable. Membrane shall have the following physical properties:

D. Low VOC adhesive primer for primary self-adhering water resistive air barrier membrane, self-adhering transition membrane and SBS modified bitumen membranes at all temperatures shall be Blueskin□LVC

Adhesive as supplied by Henry; a low V.O.C. quick setting rubber-based adhesive. Adhesive Primer shall have the following physical properties:

E. Termination Sealant shall be HE925 BES Sealant manufactured by Henry; a moisture cure, medium modulus polymer modified sealing compound having the following physical properties:
   1. Compatible with sheet air barrier, roofing and waterproofing membranes and substrate,
   2. Seals construction joints up to 1 inch wide.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
   2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
   3. Verify that substrates are visibly dry and free of moisture.

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

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

D. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

A. Install materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

B. Prepare, treat, and seal inside and outside corners and vertical and horizontal surfaces at terminations and penetrations with termination mastic.

C. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier sheet on same day. Re-prime areas exposed for more than 24 hours.

D. Apply and firmly adhere air-barrier sheets over area to receive air barrier. Accurately align sheets and maintain uniform minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure airtight installation.
   1. Apply sheets in a shingled manner to shed water.
   2. Roll sheets firmly to enhance adhesion to substrate.

E. Apply continuous air-barrier sheets over accessory strips bridging substrate cracks, construction, and contraction joints.

F. Seal top of through-wall flashings to air-barrier sheet with an additional 6-inch-wide, transition strip.

G. Seal exposed edges of sheet at seams, cuts, penetrations, and terminations not concealed by metal counter-flashings or ending in reglets with termination mastic.

H. Install air-barrier sheet and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.

I. At end of each working day, seal top edge of air-barrier material to substrate with termination mastic.

J. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

K. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
   1. Transition Strip: Roll firmly to enhance adhesion.
   2. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air-barrier material with foam sealant.

M. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fish-mouths and blisters. Patch with air-barrier sheet extending 6 inches beyond repaired areas in all directions.

3.4 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
   2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed Work, using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

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SECTION 07 28 00
ROOFING UNDERLAYMENT

PART 1 – GENERAL

1.1 SUMMARY

A. This Section specifies a self-adhering sheet membrane used as underlayment for sloped roofs.
   1. High temperature application, 260F resistance.
B. Related Sections: Refer to the following specification sections for coordination:
   1. Section 034519 - Architectural Precast Concrete Fabrications.
   2. Section 061000 - Rough Carpentry.
   3. Section 075423 - TPO Membrane Roofing.
   4. Section 075423 - Sheet Metal Flashing and Trim.
C. Referenced Standards: Comply with the requirements of the following standards published by ASTM International to the extent referenced in this section.
   1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
   2. ASTM D461 - Standard Test Methods for Felt.
   3. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
   4. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   5. ASTM D3767 - Standard Practice for Rubber - Measurement of Dimensions.
   6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
   7. ASTM G90 - EMMAqua test.

1.2 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
B. Manufacturer: Minimum 10 years experience producing roofing underlayment.
C. Installer: Minimum 2 years experience with installation of similar underlayment.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.
B. Cover materials and store in dry condition between temperatures of 40 and 90 degrees F (5 and 32 degrees C). Use within one year of date of manufacture. Do not store at elevated temperatures as that will reduce the shelf life of the product.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Acceptable Products and Manufacturers:
   1. Basis of Design: Grace Ice & Water Shield HT by GCP Applied Technologies, Inc., 62 Whittemore Avenue, Cambridge, MA 02140, Toll Free 866-333-3726, www.gcpat.com.
   2. Polystick TU Max by Polyglass USA (a Mapei Group), 1111 W. Newport Center Drive, Deerfield Beach, FL 33442; Tel: (888) 410-1375; Website: www.polyglass.us.
   3. Blueskin SA by Henry Company, 999 N. Sepulveda Boulevard, Suite 800, El Segundo, CA 90245; Tel: (800) 486-1278; Website: www.henry.com.

2.2 MATERIALS

A. Self-Adhering Sheet Membrane Roof Underlayment: Provide underlayment with the following characteristics:
   1. Material: Cold applied, self-adhering membrane composed of an innovative and proprietary rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the high-performance film with UV barrier properties.
   2. Membrane Thickness: 40 mils (1.02 mm) per ASTM D3767 Method A.
   3. Membrane Tensile Strength (one of the following):
      a. MD 33 lbf/in, CD 31 lbf/inch per ASTM D412 Die C Modified.
      b. Maximum load 25 lbf/inch per ASTM D5147.
      c. Minimum 500 psi per ASTM D412 modified.
   4. Membrane Elongation (one of the following):
      a. 200% per ASTM D412 Die C Modified.
      b. 10% at break, minimum modified bitumen portion per ASTM D5147.
   5. Low Temperature Flexibility (one of the following):
      a. Unaffected at -20 degrees F (-29 degrees C) per ASTM D1970.
      b. Pass at -22 degrees F (-30.0 degrees C) per CGSB 37-GP-56M.
   6. Adhesion to Plywood (one of the following):
      a. 5.0 lb/in. width (876 N/m) per ASTM D903.
      b. 2.0 lb/in. width minimum at 40 degrees F per ASTM D1970 and 12.0 lb/in. width minimum at 75 degrees F per ASTM D1970.
   7. Maximum Permeance: 0.1 perms per ASTM E96.
   9. Service Temperature: 158 degrees F (70.0 degrees C) per ASTM D1204
   10. Compatibility: Suitable for use under all types of sloped roofing with the exception high altitude climates where zinc, copper or Cor-Ten roof coverings are used.
   11. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.
   12. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 – EMMAqua test.
   13. Primer: Water-based as recommended by the underlayment manufacturer.
   14. Code and Standards Compliance: underlayment must meet the following requirements:
      a. ASTM D1970.
      b. ICC-ES ESR-3121, per AC 48 Acceptance Criteria for Roof Underlayments used in Severe Climate Areas.
      c. Underwriters Laboratories Inc. R13399 - Class A fire classification under fiber-glass shingles and Class C under organic felt shingles (per ASTM E108/UL 790).
      d. Underwriters Laboratories Inc. Classified Sheathing Material Fire Resistance Classification with Roof Designs: P225, P227, P230, P237, P259, P508, P510, P512, P514, P701, P711, P717, P722, P723, P732, P734, P736, P742, P803, P814, P818, P824
      e. Miami-Dade County Code Report NOA #15-0728.11
      f. Florida State Approval Report No. FL289-R3
      g. CCMC Approval No. 13671-L

PART 3 – EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, inspect existing conditions to ensure surfaces are suitable for installation of roofing underlayment. Verify flashing has been installed. Starting work indicates installers acceptance of existing conditions.

3.2 INSTALLATION

A. Installation: Install roofing underlayment on surfaces at locations indicated on the Drawings, but not less than at hips, ridges, eaves, valleys, sidewalls and chimneys, and surfaces over interior space within 36 inches (914 mm) from the inside face of the exterior wall. Strictly comply with manufacturer's installation instructions including but not limited to the following:
   1. Schedule installation such that underlayment is covered by roofing within the published exposure limit of the underlayment.
   2. Do not install underlayment on wet or frozen substrates.
   3. Install when surface temperature of substrate is a minimum of 40 degrees F (5 degrees C) and rising.
   4. Remove dust, dirt, loose materials and protrusions from deck surface.
   5. Install membrane on clean, dry, continuous structural deck. Fill voids and damaged or unsupported areas prior to installation.
   6. Prime concrete and masonry surfaces using specified primer at a rate of 500-600 square feet per gallon (12-15 sqm/L). Priming is not required for other suitable clean and dry surfaces.
   7. Install membrane such that all laps shed water. Work from the low point to the high point of the roof at all times. Apply the membrane in valleys before the membrane is applied to the eaves. Following placement along the eaves, continue application of the membrane up the roof. Membrane may be installed either vertically or horizontally after the first horizontal course.
   8. Side laps minimum 3-1/2 inches (89 mm) and end laps minimum 6 inches (152 mm) following lap lines marked on underlayment.
   9. Patch penetrations and damage using manufacturer's recommended methods.

3.3 CLEANING AND PROTECTION

A. Protection: Protect from damage during construction operations and installation of roofing materials. Promptly repair any damaged or deteriorated surfaces.

B. Repair minor damage to eliminate all evidence of repair. Remove and replace work which cannot be satisfactorily repaired in the opinion of the Architect.

C. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protective film and reclean as necessary immediately before final acceptance.

END OF SECTION

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SECTION 07 42 13.16

METAL PLATE WALL PANELS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes metal plate wall panels.

1.3 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, material panel Installer, plate material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects plate material panels, including installers of doors, windows, and louvers.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to plate material panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
   5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect plate material panels.
   6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

7. Review temporary protection requirements for plate material panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
B. Shop Drawings:
   1. Include fabrication and installation layouts of plate material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
   2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.
C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Plate Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other plate material panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Test Reports: For each product, tests performed by a qualified testing agency.
C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, plate material panels, and other manufactured items so as not to be damaged or deformed. Package plate material panels for protection during transportation and handling.
B. Unload, store, and erect plate material panels in a manner to prevent bending, warping, twisting, and surface damage.
C. Stack plate material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store plate material panels to ensure dryness, with positive slope for drainage of water. Do not store plate material panels in contact with other materials that might cause staining, denting, or other surface damage.
D. Retain strippable protective covering on plate material panels during installation.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of plate material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

A. Coordinate plate material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of plate material panel systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
   2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace plate material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bar metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide plate material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
   1. Wind Loads: As indicated on Drawings.
   2. Other Design Loads: As indicated on Drawings.
   3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURER

A. Basis of Design: AP-2000RS Rainscreen Aluminum Plate Panels as manufactured by Protean Construction Products, Inc. of Burnsville, MN. Phone: (952)895-4000 Fax: (952)895-1691. https://protean.com/.

B. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.3 PANEL SYSTEM

A. The entire panel system shall be installed in accordance with the details illustrated on the contract drawings. The panel system shall be designed based on the Rainscreen Principal which incorporates open jointing, panel weeps, drainage channels, trim, back ventilation and pressure equalization. The panels shall be positively attached to the building structure or subframe with concealed clips or tabs on the panel edges, as illustrated on the contract drawings.
   1. Coping and flashing associated with panel system shall be provided as integral to the system.

2.4 PANEL ASSEMBLY

A. The basic panel shall consist of custom fabricated solid aluminum plate, fabricated in thicknesses, lengths and widths as illustrated on the contract drawings.

B. The panel assembly shall be manufactured from 0.125-inch (minimum) aluminum plate tension leveled sheets in a smooth texture, confirming to ASTM B209, 3003 alloy, H14 temper.

C. All panel corners shall be welded and ground smooth prior to application of finish unless noted otherwise.

D. Extruded aluminum stiffeners shall be pre-attached to the panel assembly as required by design calculations to insure panel flatness and conformance with design loads. The attachment shall be made with VHB tapes and structural silicone sealant to accommodate expansion and contraction of the aluminum sheet.

2.5 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils.
   1. Color and Gloss: Match Architect's sample.

2.6 ACCESSORIES

A. Fasteners:
   1. All panels shall be positively attached to the structure through the use of concealed fasteners contained within the side joint of the assembly.
   2. No exposed fasteners will be accepted, unless noted otherwise.
   3. Fastener types and sizes shall be engineered to resist design loads and to be 304 stainless steel unless noted otherwise.

B. Extrusions:
   1. All extrusions noted in the contract documents as part of this section shall be fabricated as detailed. Extruded components shall include but are not necessarily limited to; panel stiffeners, extruded trim, and panel edge assembly.
   2. Where exposed to view, extrusions shall be finished to match the exterior skin.
   3. The alloy of the extrusions should be determined by its intended use. Such factors as corrosion resistance, machinability, formability, strength and weldability should be considered. The alloy should be listed on the product standard die drawing.

C. Flashings / Drainage Channels:
   1. Flashings and drainage channels noted in the contract documents as part of this section shall be fabricated as detailed from materials matching the specifications for the face materials and finished to match unless noted otherwise. The reverse side of all flashings shall be mill finished.
   2. Flashings and extruded trim will be fabricated in 10'-0" or 12'- 0" lengths unless otherwise noted. All inside and outside corner intersections shall be field mitered from standard flashing or extrusion lengths.

D. Sealants:
   1. Sealants shall be in accordance with the latest ASTM standards and shall comply with the sealant specifications of the contract documents. Apply sealants in compliance with ASTM standards and sealant manufacturer’s recommendations.

E. Subgirts & Clips:
   1. Subgirts and clips shall be furnished as part of the scope of this work as noted on the contract drawings and as required to provide a complete wall panel assembly. They shall be designed by the panel manufacturer to withstand the specified loads and shall typically be fabricated from mill finished, G90 galvanized steel, unless otherwise noted. Isolator shims shall be provided to separate dissimilar materials.

2.7 PANEL ASSEMBLY

A. Panel system shall be designed on the Rainscreen Principal to accommodate all local building code requirements unless noted otherwise for thermal movement, vibration, load deflection, weep drainage, ventilation, air and water tightness and attachment requirements.

2.8 DIMENSIONAL AND FLATNESS CRITERIA

A. Panels shall have a flatness criterion not to exceed 0.1875" in 24" in any direction. Using a straight edge, no point shall be more that 0.1875" away from the straight edge between two points of contact.

B. Normal dimensional tolerances shall be as follows:
   1. Length & Width:
      a. +/- 0.032-inch up to 48-inch
      b. +/- 0.064-inch over 48-inch
   2. Diagonal: +/- 0.1875-inch

a. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, plate material panel supports, and other conditions affecting performance of the Work.
B. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by plate material wall panel manufacturer.
C. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by plate material wall panel manufacturer.
D. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
E. Examine roughing-in for components and assemblies penetrating plate material panels to verify actual locations of penetrations relative to seam locations of plate material panels before installation.
F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and plate material panel manufacturer's written recommendations.

3.3 PLATE MATERIAL PANEL INSTALLATION

A. General: Install plate material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor plate material panels and other components of the Work securely in place, with provisions for thermal and structural movement.
    1. Shim or otherwise plumb substrates receiving plate material panels.
    2. Flash and seal plate material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by plate material panels are installed.
    3. Install screw fasteners in predrilled holes.
    4. Locate and space fastenings in uniform vertical and horizontal alignment.
    5. Install flashing and trim as plate material panel work proceeds.
    6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
    7. Align bottoms of plate material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
B. Fasteners:
    1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by plate material panel manufacturer.
D. Attachment Assembly, General: Install attachment assembly required to support plate material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
    1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
    2. Wet Seal Systems: Seal horizontal and vertical joints between adjacent plate material wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 07 92 00 "Joint Sealants."

3. Dry Seal Systems: Seal horizontal and vertical joints between adjacent plate material wall panels with manufacturer's standard gasket system.

E. Subgirt-and-Spline Installation: Install support assembly at locations, spacings, and with fasteners recommended by manufacturer. Use manufacturer's standard subgirts and splines that provide support and complete secondary drainage assembly, draining to the exterior at horizontal joints. Attach plate material wall panels by interlocking perimeter extrusions attached to panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal. Terminate edge of panels flush with perimeter extrusions.
   1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete plate material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by plate material panel manufacturer; or, if not indicated, provide types recommended in writing by plate material panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
   1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
   2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align plate material wall panel units within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inchoffset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as plate material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of plate material panel installation, clean finished surfaces as recommended by plate material panel manufacturer. Maintain in a clean condition during construction.

B. After plate material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace plate material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 42 47

ULTRA-HIGH-PERFORMANCE CONCRETE (UHPC) PANELS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the furnishing and installation of factory-molded, ultra-high-performance concrete (UHPC) solid exterior wall and associated UHPC components with engineered support structure (subframe). The panels shall be for exterior applications. Exterior applications shall include factory cut and pre-drilling of holes for exposed fastening to the extent feasible for the installation and field conditions.

1.2 RELATED DOCUMENTS & REFERENCES

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

B. ASTM: American Society for Testing and Materials.

1. ASTM C496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
2. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
3. ASTM C873 - Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds.
4. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness; 2011.
5. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
6. ASTM C1185-08 Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
7. ASTM D2244: - Standard Practice for Calculation of Color Differences from Instrumentally Measured Color Coordinates; 2011.
8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

9. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
10. ASTM E488 - Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements; 2010.
11. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Division 05 Section “Cold-Formed Metal Framing”.
B. Division 06 Section “Sheathing”.
C. Division 07 Section “Thermal Insulation”.
D. Division 07 Section “Membrane Air Barriers”.
E. Division 08 Section “Windows”.

1.4 DEFINITIONS

A. Design Reference Sample: Sample of UHPC color, finish, and texture that has been preapproved by Architect before execution of the Contract.
   1. Design Reference Sample Panel 1: Texture: SMOOTH
      b. Color: WHITE
      c. Aggregate: NONE
      d. Finish:
      e. Sealer: MICROSEAL

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of manufacturers’ products representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
B. Failure also includes the following:
   1. Thermal stresses transferring to building structure.
   2. Solid exterior wall panels and support structure cracking or breakage.
   3. Noise or vibration created by wind and thermal and structural movements.
   4. Loosening or weakening of fasteners, attachments, and other components.
C. Structural, Wind and Pressure Loads: As indicated on Structural Drawings.
D. Provide Design Calculations for Panel Anchors and sub-frame – report to be stamped by registered engineer.
E. Structural Performance: Provide Solid Exterior Wall Panel and support system as follows:
   1. Will not evidence deflection exceeding specified limits.
   2. Thermal Movement: Provide for thermal movement resulting from annual ambient temperature change of 120 degrees F
   3. At 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, will not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   4. Durations: As required by design wind velocity, but not less than 10 seconds.
   5. Design Panel anchorage and supporting frame to accommodate sub-frame and building deflection.
   6. Deflection of Framing Members: At design wind pressure, as follows:
      a. Deflection Normal to Wall Plane: Limited to edge of panel in a direction perpendicular to panel plane not exceeding L/240 of the panel edge length for each panel or an amount that restricts edge deflection of individual panels to manufacturer’s product limitations, whichever is less.
      b. Deflection Parallel to Panel Plane: Limited to L/360 of clear span or 1/8-inch, manufacturer’s product limitations, whichever is smaller.
      c. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to 2 times the length of cantilevered member divided by 175, or manufacturer’s product limitations, whichever is smaller.
F. Story Drift: Accommodate design displacement of adjacent stories.

G. Design Displacement: As indicated on Structural Drawings.
H. Maximum Solid Exterior Wall Panels Deflection: 1/360 of span or less when tested in accordance with positive and negative pressures.
I. Solid exterior and interior wall panel system shall comply with 2009 International Building Code 1405.16.1 Panel Siding.
J. Anchorage system: Wall anchorages for exterior systems shall be designed to prevent thermal transfer through fasteners to interior side of cold-formed metal framing which could result in condensation inside the stud cavity.

1.6 SYSTEM DESCRIPTION

A. Complete system shall include the design and installation of the solid exterior wall panels and support structure system to provide, in conjunction with wall substrate and air barrier, a weather-tight wall assembly utilizing back ventilated façade standards or 'rain screen principle'.

1.7 SUBMITTALS

A. Product Data: For each type of product indicated, including:
   1. Technical Summary
   2. Color Specifications Guidelines
   3. Color Variation Example
   4. MicroSeal/T Data Sheet
   5. Manufacturer's Hardware Technical Data
   6. Anchor Product Data Sheet
   7. Anchors and/or fasteners test reports
   8. Attachment Components Product Data
   9. Attachment Components Installation instructions
B. Shop Drawings: Show fabrication and installation details for UHPC panels including the following:
   1. Panel elevations, sections, and dimensions.
   2. Panel thickness and fastener type and size.
   3. Finishes.
   4. Joint and connection details.
   5. Erection details.
   6. Panel cut-outs for Mechanical, Electrical, Plumbing, and Security devices and items.
   7. Panel frame details for typical panels including sizes, spacings, thicknesses, and yield strengths of various members.
   8. Locations and details of connection hardware attached to structure.
   9. Sizes, locations, and details of flex, gravity, and seismic anchors for typical panels.
   10. Erection sequence for special conditions.
   11. Relationship to adjacent materials.
   12. Shop Drawings for Mockups: Include plans, elevations, sections, full-size details, and attachments to other work.
C. Samples: Representative of finished exposed face of solid exterior UHPC panel. For each color and pattern specified, submit a minimum of two samples, each not less than 6 by 6 inches (152 by 152 mm), and of actual thickness. Each sample to be labeled and dated. Approved sample to be stamped approved and returned to manufacturer for reference.
D. Delegated-Design Submittals:
   1. For Exterior Solid UHPC Wall Panel, support system, fasteners and anchors to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
E. Sustainable Submittals:
   1. Product Data: For products that have been extracted, harvested, recovered, and/or manufactured within 300 miles of project site, documentation to include:
      a. Table summarizing all materials used including:
         i. Item description.
         ii. Place of manufacturing origin.
         iii. Weight (or cost, if weight unavailable).

iv. Totals of the products sourced regionally versus outside of region along with percentages of total.

b. Contractor's Schedule of Values.

2. Product Data: For products with reused, repurposed, or recycled material content, documentation to include:
   a. Total project(s) material cost.
   b. Table summarizing all materials used, including:
      i. Item description.
      ii. Percentage of the material that is reused, recycled, or repurposed (or zero for virgin material).
      iii. Weight (or cost, if weight unavailable).
      iv. Total and percentages of virgin materials versus reused, recycled, and repurposed materials.
   c. Contractor or manufacturer certifications that demonstrate the materials were reused, recycled, or repurposed and the percentage of this content.

F. Quality Assurance Submittals:
   1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Independent QMS Certification and Listing Document
   3. Certificates: Qualification Certificates: Submit certificate indicating compliance with qualification requirements in "Quality Assurance" article.
   4. Product certificates signed by manufacturers certifying materials comply with specified performance characteristics and criteria and physical requirements.
   5. Manufacturer's quality documentation:
      a. Quality Management - Tolerances + Acceptance Criteria
      b. Certified Test Results
      c. Uncrating, Storage, + Handling
      d. Field Cutting Instructions-Wet
      e. Field Drilling Instructions-Wet

G. Closeout Submittals:
   1. Operation and Maintenance Data:
      a. Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section.
      b. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.8 QUALITY ASSURANCE

A. Pre-Bid Pre-Qualification Submittal:
   1. Contractors interested in proposing a solid exterior wall panel system produced by a manufacturer that is not the basis of design indicated in this section, must provide company and product details as a necessary pre-bid pre-qualification submittal, to demonstrate full compliance with the documents and design and quality standards, and to demonstrate capabilities and experience required by the documents and the project scope. The following also applies to this pre-bid Pre-Qualification submittal:
      a. A list of at least (3) complete projects using the solid exterior wall panel system produced by a manufacturer that is not the basis of design. All submitted projects must demonstrate the inclusion under one contract of the supply and installation of a solid exterior wall and soffit panel and pre-engineered support structure (system).
      b. In addition to demonstrating full compliance with the documents quality standards, the submitted solid exterior wall panel must meet the design intent, including specified colors, surface sheen, and patterns as judged solely by the Architect.
      c. The Architect's decision shall be final. All approvals shall be made in writing and evidence shall be provided via an addendum.

B. Fabricator/Installer Qualifications:
   1. Installer shall be experienced in performing work with thin concrete cladding panels of similar type and scope. Supervisors and installers shall have a minimum 5 years experience of projects of similar type.

C. Mockups:
   1. Build mockup indicated on Drawings to verify selections made under sample submittals, and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

2. Build mockup, including insulation, supports, attachments, and accessories for typical conditions/parts not to exceed one (1) window surround, cornice section and or building corner and not more than 100 square foot area.
3. Approval of mockup does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Pre-installation Meetings:
1. Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturers' installation instructions.
2. Conduct observation and evaluation of the first 300 sf area installed with report by manufacturer's representative.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver exterior solid UHPC wall panels and support system components packaged to comply with manufacturers' requirements and adequately protected from damage during shipment.
B. Protect components from adverse job conditions prior to installation.
C. Protect components from damage after installation including staining or solvents used in adjacent work, impact damage and abrasion, etc.
D. Panels are to be stored and handled vertically until installed.
E. Store exterior solid UHPC wall panels and support system components on platforms or pallets, covered with tarpaulins so that water accumulations will drain freely.
F. Store with non-staining resilient spacers between panels. Store components with suitable ventilation.
G. Do not store exterior solid UHPC wall panels and support system components in contact with other materials that might cause staining, denting, surface damage or other deleterious effects.

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify locations of structural members and wall opening dimension by field measurements before concrete panel fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made with delaying the Work, either establish framing and opening dimensions and process with fabricating concrete panels without field measurements or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and opening correspond to established dimensions.
2. Field trimming is required for all penetrations through panels.

PART 2 – PRODUCTS

2.1 SOLID EXTERIOR UHPC WALL PANELS

A. Manufacturers: The construction documents are based on the manufacturer and product/system noted below. As such, TAKTL® is a pre-approved Manufacturer for the scope described under this section. Other manufacturers will be considered, provided that they submit for approval according to the Part 1 "Quality Assurance" provisions of this specification section.
B. Basis of Design Product/Manufacturer: TAKTL® Exterior and Interior Patterned Wall and Facade Panels, factory-formulated with TAKTL® ultra-high-performance concrete and reinforced with alkali-resistant (AR) glass mesh, factory-mixed and manufactured; complying with ASTM C1186. Type A, Grade IV. (U.S. Contact: TAKTL, LLC 230 BRADDOCK AVENUE, KEYSTONE COMMONS PORTAL 9, TURTLE CREEK, PA 15145 Phone: 412-486-1600; www.taktl-llc.com.
C. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
D. Panel Performance Characteristics:
1. Thermal Expansion (ASTM C531-00): 6.41E-06 in/in/degree F (0.01 inches per meter at 40-degree temperature change)
2. Material Behavior in Vertical Tube Furnace @ 750 degrees C (ASTM E136-09): Pass
3. Density – Thin Panel (ASTM C1185-08): 137 lbs./ft3 (2,194 kg/m3).

4. Flexural Strength (Thin Panel) – Dry (ASTM C1185-08): Pass, Mean length direction not less than 3,800 lbs./in2 and width direction 3,600 lbs./in2.
5. Flexural Strength (Thin Panel) – Wet (ASTM C1185-08): Pass, Mean length direction not less than 3,800 lbs./in2 and width direction 3,400 lbs./in2.
6. Freeze/Thaw (Cladding) (ASTM C1185-08): Pass. No visible cracks and not less than 90% post-exposure strength retention.
7. Moisture Content – Thin Panel (ASTM C1185-08): less than 1.0%
8. Moisture Movement – Thin Panel (ASTM C1185-08): 0.00%
9. Warm Water (ASTM C1185-08): Pass. No visible cracks or structural alteration. Not less than 90.0% ratio of retained post-exposure strength.
10. Water Absorption - Thin Panel (ASTM C1185-08): less than 4.0%
11. Water Tightness (ASTM C1185-08): Pass. No water droplet formation.
12. Anchor Pullout Strength (ASTM E488-96): 10mm embed in 16mm thick panel
    a. Tension (Min. Mean) Peak Load – 520 lbf or greater
    b. Shear (Min. Mean) Peak Load – 890 lbf or greater
13. Surface Burning Characteristics (ASTM E84-09):
    a. Flame Spread – Pass
    b. Smoke Developed – Pass
    c. Class A.
14. Colorfastness & Weathering (500 hours) (ASTM G155-05a & D2244-09a):
    a. 2.07 delta E. without coating (standard, varies with pigment type, texture and coating [consult with manufacturer for color information]).
15. Compressive Strength (ASTM C873): ≥ 18,332 lbs./in2 (126 MPa).
16. Tensile (splitting matrix prism) Strength (ASTM C496): 1,319 lbs./in2 (9 MPa).

E. Panel Finishes:
1. Finish exposed, front-facing surface of UHPC as follows, to match approved design reference sample. Panel faces shall be free of joint marks, grain, or other obvious defects.
2. Design Reference Sample:
    a. Pattern – SEE DRAWINGS
    b. Pattern Direction SEE DRAWINGS

F. Panel Sizes: Vary and as indicated on approved panel/part layout.
G. Panel Dimensional Tolerances
H. Panel Thickness: 5/8-inch (16-mm) nominally, thickness variation +/- 0.05-inch (1.3-mm)
I. Panel Edges: Square cut (Standard)
J. Panel Weight: 7.2 lbs/ ft2, at 5/8-inch thickness

2.2 SUPPORT STRUCTURE (provided by Installing contractor)

A. Support Structure:
1. Complete sub-frame assembly to support and anchor solid exterior solid UHPC wall panels. Aluminum support structure to be anchored to building structure.

B. Components:
1. Horizontally-oriented concealed fastener attachment system support bracket/angle bracket anchored directly to building structure.
2. Vertical girt profile, shelf shimming extrusions or cold formed channels that fasten into support brackets and supports.
3. For Exposed Attachment Horizontal hat channel to be painted black. Fasteners: Stainless steel with color-matched, powder coated heads.

2.3 AUXILIARY MATERIALS (provided by installing contractor)

A. For Exposed Attachment Face fasteners flush to face of A|UHPC panel fastened into horizontal or vertical hat channel support member. Panel fastener holes to be factory-drilled by A|UHPC manufacturer.
1. Basis-of-Design Product/Manufacturer (Exposed): TAKTL color-matched powder coated stainless steel face fasteners for façade panels; provided by panel manufacturer

B. Adhesives & Sealants: As recommended in UHPC panel manufacturer's written instructions (to be determined per application).

C. Stainless Steel Drill Screws: Of sufficient lengths and sizes to securely fasten support structure to building wall framing members, and as follows:
   1. Screws complying with ASTM C 1002 for fastening to steel members less than 0.033 inches (0.84 mm) thick.
   2. Screws complying with ASTM C 954 for fastening to steel members from 0.033 to 0.112 inches (0.84 to 2.84 mm) thick.

D. Miscellaneous Materials
   1. Aluminum Extrusions: ASTM B 221, Alloy 6005 T5.
   2. Aluminum Sheet: ASTM B 209, Alloy 6061-T5
   3. Carbon Steel Shapes and Plates: ASTM A 36, finished as follows:
      a. ZAM,Galvalum or Hot dipped.
   4. Stainless steel Bars and shapes: ASTM A 276, Type 304 or better.

2.4 FABRICATION

A. Fabricate wall panels and accessory items in accordance with manufacturers' recommendations and approved submittals.

B. Panels shall be fabricated to size, with all face fastened anchor holes factory-drilled by the UHPC panel manufacturer.

C. Field-cut panels and drill face-fastening anchor holes in accordance with the UHPC panel manufacturer's written directions.

D. Do not field-modify factory-drilled concealed/undercut panel anchor holes.

E. Fabricate all panels to profiles, colors and textures per samples and approval selected by the Architect.

F. Fabricate panels in accordance with manufacturers' Quality Management System Tolerances and Acceptance Criteria.

2.5 FABRICATION TOLERANCES

A. Manufacturing Tolerances: Manufacture UHPC panels so each finished unit complies with the following dimensional tolerances.
   1. Overall Height and Width of Units, Measured at the Face Adjacent to Mold: plus or minus 1/16 inch.
   2. Weight of finished panels not to exceed 7.4 pcf.
   3. Edge Return Thickness: Plus 5/8 inch, minus zero inch.
   4. Texture and Reveal Depth: Maximum 1/8 inch.
   5. Thickness: Plus 1/4 inch, minus zero inch.
   6. Variation from Square or Designated Skew (Difference in Length of Two Diagonal Measurements): Plus or minus 1/16 inch per 72 inches or plus or minus 1/8 inch total, whichever is greater.
   7. Local Smoothness: 1/8 inch per 10 feet.
   8. Bowing: Not to exceed L/240 unless unit complies with erection tolerances using connection adjustments.
   9. Length and Width of Block Outs and Openings within One Unit: Plus or minus 1/4 inch.
   10. Location of Window Opening within Panel: Plus or minus 1/4 inch.
   11. Maximum Permissible Warpage of One Corner out of the Plane of the Other Three: 1/16 inch per 12 inches of distance from nearest adjacent corner.

B. Position Tolerances: Measured from datum line locations, as indicated on Shop Drawings.
   1. Panel Alignment: Plus or minus 1/8 inch.
   2. Special Handling Devices: Plus or minus 3 inches (where applicable).
   3. Location of Bearing Devices: Plus or minus 1/16 inch.
   4. Cutouts: Plus or minus 3/8 inch. Refer to manufacturer's guide to cutouts and notching of panels in the field cutting instructions.

C. Color Variation and Aggregate Distribution Variation Acceptance Criteria: Per Manufacturer's Tolerances and Acceptance Criteria.

D. Blemishes and Chips Acceptance Criteria: Per Manufacturer's Tolerances and Acceptance Criteria.

E. Acceptance of installed panels shall be assessed when viewed from a distance of 20 ft., under even light, and from a position 90 degrees to the building elevation.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturers' product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Examine structure and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation contractor will be expected to shim panel supports as required to allow for final panel installation that meets or exceeds erection tolerances as outlined below.

3.3 ERECTION/INSTALLATION – DELEGATED DESIGN

A. Install wall reinforcements, channel cleats, clips, hangers, and other accessories required for connecting UHPC wall panels to supporting members and backup materials per project/façade engineers approved design.
B. Provide miscellaneous reinforcement of adhered panel parts and unitized panel parts per manufacturer and installation contractor's engineer.
C. Lift UHPC wall panels and install without damage.
D. Install UHPC panels level, plumb, square, and in alignment.
E. Provide temporary supports and bracing as required to maintain position, stability, and alignment of panels until permanent connections are completed.
   1. Maintain horizontal and vertical joint alignment and uniform joint width.
   2. Remove temporary shims, wedges, and spacers as soon as possible after connecting is complete.
   3. Remove temporary projecting hoisting devices.

3.4 ERECTION TOLERANCES

A. Erect UHPC panels to comply with the following noncumulative tolerances:
   1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch
   2. Top Elevation from Nominal Top Elevation as follows:
      a. Exposed Panel Face Relative to Adjacent Panel: 3/16 inch
   3. Support Elevation from Nominal Elevation as follows:
      a. Maximum Low: 1/2 inch
      b. Maximum High: 1/4 inch
   4. Maximum Plumb Variation over the Lesser of Height of Structure or 100 feet: 1 inch
   5. Plumb in any 10 feet of Element Height: 1/4 inch
   6. Maximum Offset in Vertical/Horizontal Alignment of Matching Edges: 1/8 inch
   7. Face Width of Joint as follows (governs over joint taper):
      a. Panel Dimension 20 feet or Less: 1/4 inch
   8. Maximum Joint Taper in 10 Feet: 1/8 inch
   9. Differential Bowing, as Erected, between Adjacent Members of Same Design: 1/8 inch

3.5 CLEANING AND PROTECTION

A. Perform cleaning procedures according to UHPC panel manufacturer's written instructions.
B. Clean soiled UHPC surfaces with water, using soft fiber brushes and sponges, and rinse with clean water. Mild detergent may be used if water alone is not satisfactory. Power washing is permitted, if the spray is not concentrated and nozzle is not held within 5 ft. for the panel surface. Prevent damage to UHPC surfaces and staining of adjacent materials.
C. Should the standard cleaning procedure be found deficient is special circumstances, do not
D. Prevent damage to UHPC surfaces and staining of adjacent material.

E. The installer is responsible for removing all metal, and UHPC scraps, clips, or fasteners along with crates and packing materials from this work, from the site when the installation is complete.

END OF SECTION

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SECTION 07 46 00

ALUMINUM SIDING AND BATTENS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Aluminum siding.
B. Aluminum battens.
C. Aluminum back-framing system.
D. Aluminum trim and accessories.
E. Anchors and connections.

1.2 RELATED SECTIONS

A. Section 079200 - Joint Sealants: Sealants used in conjunction with aluminum siding installation.

1.3 REFERENCES

A. ASTM D 958 - Practice for Determining Temperatures of Standard ASTM Molds for Test Specimens of Plastics.
B. AAMA 2605-05 - Voluntary Specification, Performance requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
C. AAMA 2604 - Voluntary Specification, Performance requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels.
D. AAMA 2603 - Voluntary Specification, Performance requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.

1.4 PERFORMANCE REQUIREMENTS

A. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code.
B. Movement: Accommodate movement within system without damage to components or movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
C. Provision for Thermal Movements:
   1. Provide for expansion and contraction of component materials, as will be caused by an exterior ambient temperature ranging from -10 degrees F to metal surface temperature of +180 degrees F, and an interior temperature range of +50 degrees F to +100 degrees F, without causing buckling stresses on glass or stone, failure of glass, metal, stone or joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects.
   2. Provide accommodation for movement in the design and identified on submitted shop drawings, accompanied by thermal calculations.
D. Deflection Criteria:
   1. The deflection of metal panels, fascia or other sheet fabricated elements is not to exceed L/120 of the span or 3/4 inch whichever is less or at specified design pressure. Deflection is to be measured relative to the horizontal and vertical support members with the allowable deflection being determined by the lesser dimension.
E. Anchors and Connections - General:
   1. Anchors, connections and assemblies connecting the unitized window wall components and associated fabrications to the supporting construction are shown on the Drawings as suggested locations and details for the unitized window wall manufacturer/installer's information. The unitized window wall manufacturer/installer is responsible for the structural design of the connections and anchors, including all connecting hardware, accessories and reinforcing necessary for fabrication, assembly and installation of the unitized window wall system and associated fabrications.
   2. The unitized window wall manufacturer is to notify the Architect in writing prior to the submittal of shop drawings of any changes in the proposed locations of connections and anchors.
   3. The Architect's review of shop drawings is not to be construed as removing responsibility from the unitized window wall manufacturer/installer for structural failures related to design, fabrication, assembly, installation and fabrication service.
F. Cast-In-Place Concrete Inserts and Anchors: Headed concrete studs welded to steel elements and cast-in-place with structural concrete are to have a minimum safety factor of 2.0 against ultimate failure. Unistrut type or ferrule type concrete inserts are to have minimum safety factor of 3.0 against ultimate failure. All drilled expansion or wedge type anchors are to have a minimum safety factor of 4.0 against ultimate failure. Use of 1/3 increase for allowable stresses is not acceptable unless written approval by manufacturer is provided.
G. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

1.5 SUBMITTALS

A. Submit under provisions of Section 013323 - Submittals.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Indicate dimensions, layout, joints, expansion joints, construction details, methods of anchorage, panelization dimensions and details, and interface with adjacent materials.
D. Sustainable Submittals: Provide documentation of how the requirements of Credits will be met:
   1. Construction Waste Management: For products being recycled or reused, provide the following documentation:
      a. Summary log of all construction waste generated including tonnage or volume, type of waste, and disposal methods, along with names of haulers and recyclers:
         i. Include all waste materials for all projects that are applicable for this measure.
         ii. Tabulate all waste materials, including both the recycled and disposed materials and percentages of total.

b. Invoices from haulers and recycling firms that support the details in the summary log regarding handling of waste.

2. Regional Materials: Product data for products that have been extracted, harvested, recovered, and/or manufactured within 300 miles of project site, documentation to include:
   a. Table summarizing all materials used including:
      i. Item description.
      ii. Place of manufacturing origin.
      iii. Weight (or cost, if weight unavailable).
      iv. Totals of the products sourced regionally versus outside of region along with percentages of total.
   b. Contractor's Schedule of Values.
3. Reused/Recycled Materials: Product data for products with reused, repurposed, or recycled material content, documentation to include:
   a. Total project(s) material cost.
   b. Table summarizing all materials used, including:
      i. Item description.
      ii. Percentage of the material that is reused, recycled, or repurposed (or zero for virgin material).
      iii. Weight (or cost, if weight unavailable).
      iv. Total and percentages of virgin materials versus reused, recycled, and repurposed materials.
   c. Contractor or manufacturer certifications that demonstrate the materials were reused, recycled, or repurposed and the percentage of this content.

E. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

F. Verification Samples: For each finish product specified, two batten samples, minimum size 4 inches (51 mm) by 12 inches (89 mm), representing actual product, color, and gloss.

G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

H. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of components.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum ten years experience producing aluminum finishes of the types specified in AAMA 2604 and 2605 Certified.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and gloss are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.
   4. Mock-up to be built on site, but separate from the finished work. Mock-up may not be incorporated into the final work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package and store products under cover in manufacturer's unopened packaging until ready for transport and installation.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

D. Prevent contact with materials capable of causing discoloration or staining.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not fabricate products under environmental conditions outside manufacturer's absolute limits.

1.9 COORDINATION

A. Coordinate Work with installation of windows, louvers, and adjacent components or materials.

1.10 WARRANTY

A. Manufacturer's limited lifetime warranty against cracking, peeling and gloss/color retention within the guidelines stated by the American Aluminum Manufactures Association (AAMA).
   1. Standard Colors:
      a. Dulux Duratec - AAMA 2604 (5 Year Florida) 15 Year manufacturer's Warranty
      b. Dulux Fluoroset - AAMA 2605 (10 Year Florida) 20 Year manufacturer's Warranty

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Knotwood LLC., which is located at: 6715 NE 63rd St. #223, Vancouver, WA 98661: info at kleb@knotwood.com. Web: https://knotwood.com/.
B. Substitutions per Section 012513 – Product Substitution Procedures.

2.2 MATERIALS

A. Extruded Aluminum Siding and Battens: Knotwood Aluminum Siding and Battens with Alluminate bonded film finish on extruded aluminum.

2.3 FINISHES

A. Pretreatment: E-CLPS Chrome Free five stage aluminum pretreatment system. Complies with AAMA 2603 AAMA 2604 and AAMA 2605 Superior Performance Standard and meets EPA, OSHA, State and Local environmental requirements and contains no chromates, cyanides or other heavy metals. Waste treatment is usually a simple pH neutralization and disposal to the sanitary sewer.
B. Dulux Group Mannex base coat and Duratec Series electrostatically applied Architectural Powder Coatings are approved to AAMA 2604 Performance Standard.
   1. Gloss Level: Standard Gloss is 30 percent, plus or minus 5 percent.

2.4 FABRICATION

A. Prepare surfaces, pre-treat and coat components in accordance with AAMA 2604 and 2605 Quality Standards and applicable European standards for the coating material specified.
B. Wrap and package coated components using methods suitable for transit and covered site storage without damage.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until colors have been verified.
B. Verify framing members are ready to receive panel system.
C. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 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 material under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.
B. Battens and backing system to be installed in panelized sections for ease of future removal and maintenance.
C. Fasten siding to structural supports; aligned, level, and plumb.
D. Locate joints over supports.
E. Install expansion control joints where indicated.
F. Use concealed fasteners unless otherwise approved by Architect.
G. Install components and accessories in accordance with best practice, with all joint members plumb and true.

3.4 TOLERANCES

3.5 FIELD QUALITY CONTROL

A. After installation of soffits, check entire surface for obvious flaws or defects.
B. Replace and repair any problem areas, paying close attention to the substrate for causes of the problem.

3.6 CLEANING

A. After installation of components, clean as necessary to remove all fingerprints and soiled areas.
B. Upon completion of installation, clean entire area, removing all scrap, packaging, and unused materials related to this work.

3.7 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO), EXTERNALLY REINFORCED MEMBRANE ROOFING

PART 1 – GENERAL

1.1 SUMMARY

A. Furnish and install elastomeric sheet roofing system over concrete deck, including:
   1. Roofing manufacturer's requirements for the specified warranty.
   2. Preparation of roofing substrates.
   3. Tapered insulation.
   4. Elastomeric membrane roofing.
   5. Metal roof edging and copings.
   6. Flashings.

B. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

D. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

E. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 RELATED SPECIFICATION SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.

C. Section 07 71 00 - Roof Specialties: Manufactured copings, fascias, gravel stops, and other flashing-related items.
D. Section 07 72 00 - Roof Accessories: Roof hatches, vents, and manufactured curbs.

1.3 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
B. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 2003.
C. ASTM D 1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting; 2003.
D. ASTM D 1079 - Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials; 2005a.
E. ASTM D 6878 - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2003.
F. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams; 2003.
G. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2003. (ANSI/SPRI ES-1).

1.4 SUBMITTALS

A. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
   2. Where UL requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified, as applicable; include data itemizing the components of the classified or approved system.
B. Samples: Submit samples of each product to be used.
C. Shop Drawings: Provide:
   1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
   2. For tapered insulation, provide project-specific layout and dimensions for each board.
D. Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.
E. Sample Warranty.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Roofing installer shall have the following:
   1. Current Firestone Licensed Contractor/Master Contractor status.
   2. At least five-years experience in installing specified system.
B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials.
   1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
   2. Notify Architect well in advance of meeting.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
B. Store materials clear of ground and moisture with weather protective covering.
C. Keep combustible materials away from ignition sources.

1.7 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
B. Warranty: Firestone 10-year Red Shield Limited Warranty covering membrane and membrane accessories.
   1. Limit of Liability: No dollar limitation.
   2. Scope of Coverage: Repair leaks in the roofing system caused by:
      a. Ordinary wear and tear of the elements.
      b. Manufacturing defect in Firestone brand materials.
      c. Defective workmanship used to install these materials.
      d. Damage due to winds up to 88 km/h (55 mph).
   3. Not Covered:
      a. Damage due to winds in excess of 55 mph.
      b. Damage due hurricanes or tornadoes.
      c. Hail.
      d. Intentional damage.
      e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer - Roofing System:
   1. Basis of Design: Firestone Building Products Co., Nashville, TN. www.firestonebpco.com.
   2. GAF Materials Corporation, Parsippany, NJ. www.gaf.com/en-us.
   3. Carlisle SynTec Systems, Carlisle, PA. www.carlislesyntec.com.
   4. Mule-Hide Products Company, Inc., Beloit, WI. www.mulehide.com.
   5. Johns Manville Company, Denver, CO. www.jm.com.
      a. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
         i. Specializing in manufacturing the roofing system to be provided.
         ii. Minimum ten years of experience manufacturing the roofing system to be provided.
         iii. ISO 9002 certified.
         iv. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions as determined by owner or owner's authorized agent
B. Substitution Procedures: See Section 01 25 13 – Product Substitution Procedures.
   1. Submit evidence that the proposed substitution complies with the specified requirements.

2.2 ROOFING SYSTEM DESCRIPTION

A. Roofing System:
   1. Membrane: Thermoplastic Polyolefin (TPO), fleece backed.
   2. Thickness: As specified elsewhere.
   3. Membrane Attachment: Low Rise Foam Adhesive.
   4. Slope: Deck is both flat and pitched to drains.
   5. Comply with applicable local building code requirements.
   6. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A or B Fire Hazard Classification.

2.3 TPO MEMBRANE MATERIALS

A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D 6878, with polyester weft inserted reinforcement and the following additional characteristics:
   1. External sheet reinforcement: Polyester fleece backing.

2. Thickness: 1.52 mm (0.060 inch) plus/minus 10 percent, with coating thickness over reinforcement of 0.61 mm (0.024 inch) plus/minus 10 percent.
3. Sheet Width: Provide the widest available sheets to minimize field seaming.
4. Puncture Resistance: 1174 N (265 lbf), minimum, when tested in accordance FTM 101C Method 2031.
5. Membrane Color: White
6. Acceptable Product: UltraPly TPO XR 115 by Firestone.

B. Membrane Fasteners (if required): Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

C. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 457 mm (18 inches) wide.

D. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
1. Thickness: 1.52 mm (0.060 inch) plus/minus 10 percent.
2. Tensile Strength: 10.7 MPa (1550 psi), minimum, when tested in accordance with ASTM D 638 after heat aging.
3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D 638 after heat aging.
4. Tearing Strength: 53 N (12 lbf), minimum, when tested in accordance with ASTM D 1004 after heat aging.
5. Color: White.
6. Acceptable Product: UltraPly TPO Flashing by Firestone.

E. Tape Flashing: 140 mm (5-1/2 inch) nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 1.6 mm (0.065 inch) nominal; TPO QuickSeam Flashing by Firestone.

F. Bonding Adhesive: Two component, low-rise polyurethane foam as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer; XR Stick by Firestone.

G. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

H. Termination Bars: Aluminum bars with integral caulk ledge; 33 mm (1.3 inches) wide by 2.5 mm (0.10 inch) thick; Firestone Termination Bar by Firestone.

I. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Firestone.

J. General Purpose Sealant: UltraPly TPO General Purpose Sealant by Firestone.

K. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing by Firestone.

L. Roof Walkway Pads: Non-reinforced TPO walkway pads, 3 mm (0.130 inch) by 760 mm (30 inches) by 12.19 m (40 feet) long with patterned traffic bearing surface; UltraPly TPO Walkway Pads by Firestone.

2.4 ROOF INSULATION MATERIALS

A. Tapered insulation compatible with roofing membrane and built-up to meet required slopes.
1. Installed above concrete deck and covered with an approved roof covering.
2. Meets ASTM D 3273 standards for mold resistance.
3. Meets one of the following material standards:
   a. ASTM C 578
   b. ASTM C 1278
   c. ASTM C 1177
   d. ASTM C 1289, Type I or II
4. Compressive Strength: Minimum 60 psi per ASTM D 1621.

B. Adhesive: Per manufacturer's recommendation.

PART 3 – EXECUTION

3.1 GENERAL

A. Install roofing, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
D. Perform work using competent and properly equipped personnel.
E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 15 to 25 degrees C (60 to 80 degrees F).
G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
    1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
    2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
    3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment, and that deflection will not strain or rupture roof components or deform deck.
B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
C. Examine roof substrate to verify that it is properly sloped to drains.
D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive are not drawn into the building through air intakes.
B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
C. Fill all surface voids in the immediate substrate that are greater than 6 mm (1/4 inch) wide with fill material acceptable insulation to membrane manufacturer.
D. Seal, grout, or tape open joints, where needed, to prevent material adhesive seepage into building.

3.4 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
   1. Do not apply bonding material to fleece backing or to seaming area of membrane. Roll the freshly bonded membrane with weighted roller to ensure proper adhesion, per manufacturer's application instructions.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 1:6 (2 in 12 inches) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 460 mm (18 inches) in diameter and square penetrations less than 200 mm (4 inches) square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.5 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.

D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 200 mm (8 inches) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

E. Roof Drains:
   1. Existing Drains: Remove all existing flashings, drain leads, roofing materials and cement from the drain; remove clamping ring.
   2. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
   3. Position membrane, then cut a hole for roof drain to allow 12 to 19 mm (1/2 to 3/4 inch) of membrane to extend inside clamping ring past drain bolts.
   4. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
   5. Apply sealant on top of drain bowl where clamping ring seats below the membrane
   6. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

F. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.

2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 50 mm (2 inches) deep, with at least 25 mm (1 inch) clearance from penetration, sloped to shed water.
3. Structural Steel Tubing: If corner radii are greater than 6 mm (1/4 inch) and longest side of tube does not exceed 305 mm (12 inches), flash as for pipes; otherwise, provide a standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

3.6 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 25 mm (1.0 inch) and maximum of 75 mm (3.0 inches) from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 150 mm (6 inches) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 150 mm (6 inches) on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.7 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
B. Perform all corrections necessary for issuance of warranty.

3.8 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.9 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

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SECTION 07 55 56

HOT FLUID-APPLIED ROOFING

PART 1 – GENERAL

1.1 SUMMARY

A. Hot fluid-applied, reinforced, rubberized asphalt roofing system as shown on the Drawings and as specified herein, including, but not limited to the following:
   1. Protected membrane roof system, with cast-in-place concrete wearing slab.
   2. Membrane manufacturer's representative for quality control.
   3. Associated construction and installation accessories of the roofing system including but not limited to sealants, and sheet metal fabrications.

1.2 PERFORMANCE REQUIREMENTS

A. Provide materials and roofing systems which have been tested, listed and labeled by U.L. for "Class A (1)" rating.
B. Install hot fluid-applied roofing and flashing system with compatible components that will not permit passage of liquid and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

1.3 QUALITY ASSURANCE

A. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the work.
B. Provide materials and products specified herein for the roof system as the products of one manufacturer to ensure compatibility, uniformity and warrantability of the roof system.
C. Materials and Methods:
   1. Provide materials and methods of installation in accordance with the current printed published instructions, details and specifications of the Principal Roofing Material Manufacturer and the National Roofing Contractor's Association (NRCA) Roofing and Waterproofing Manual for slopes and type of substrates shown, except as hereafter modified and as approved by the Principal Roofing Material Manufacturer.

2. In the event of a conflict between these specifications and those of the Principal Roofing material Manufacturer and the National Roofing Contractor's Association (NRCA) Roofing and Waterproofing Manual, the more stringent or greater is to take precedent and be the one utilized for the installation.
3. All deviations from this specification must be requested in writing to the Architect for approval prior to submittals in accordance with the requirements of Section 01 60 00, Product Requirements.

D. Installing Contractor Qualifications:
1. The Roofing Contractor (Installer) is to be acceptable to the Manufacturer of the Roof System and the Architect. The Roofing Contractor (Installer) to also be a Certified Installer of the Specified Roof System and is to provide written evidence as part of the required submittals.
2. In addition to the above, the Roofing Contractor is to have installed the not less than three (3) roofing projects of similar scope or not less than 100,000 sq ft of the specified membrane system in the past 18 months. Provide written description of this experience to the Architect.
3. The Roofing Contractor (Installer) is to have not less five (5) consecutive years' experience installing the manufacturer's roofing system and is to provide written evidence as part of the required submittals.
4. The Roofing Contractor (Installer) is to be capable of responding to the installation site to perform repairs for leaks and other roof system damage within 24 hours from receipt such notice.

E. The manufacturer of the Roof System is to provide a qualified representative for inspection of the roofing system before and during installation and upon completion of the roofing system installation to ascertain that the roofing system has been installed in accordance with the manufacturer's published specifications, details of the roofing system and this specification.

F. The Roof System Manufacturer is to review the proposed roofing installation and the Contract Document Drawings. Include in the work, in addition to that shown on the Drawings and specified herein all additional work required by the Roof System Manufacturer at no additional cost to the Owner as required for a complete warrantable roofing system.

G. Manufacturer's Certification of Installation: The Roof System Manufacturer, after review of the proposed roofing installation and the Contract Document Drawings, is to submit a written certification stating the following:
1. That the proposed installation and details have been reviewed by the Roofing Manufacturer's Technical Department.
2. List all exceptions and required modifications to the proposed installation and the Contract Documents.
3. That the proposed installation will qualify for the herein specified warranty period and terms when installed in accordance with the Roof System Manufacturer's Installation Instructions, the Contract Documents and any accepted proposed exceptions or required modifications
4. Submit Certification signed by an officer of the Roof System Manufacturer empowered to sign such certification as specified herein.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01 33 23 – Submittals:
1. Product Data: Submit manufacturer's specifications, installation instructions, and general recommendations for each material required. Include data substantiating that materials comply with requirements.
2. Samples:
   a. Three (3), 12-inch x 12-inch x 2-inch-thick samples of each type of underlayment board.
3. Shop Drawings: Provide shop drawings indicating review and approval, signed by the Roof System Manufacturer. Include the following:
   a. Outline of each roof or roof area, numbered for reference, showing the location and type of all penetrations, and keyed locations for all details.
   b. Perimeter and all penetration details and special details including methods of attachment, splices, sizes, spacing and types of all anchors and fasteners.
4. Material Certification: Copies of manufacturer's certification of quality and melting point for delivered hot bulk materials.
5. Installing Contractor's Certification:
   a. Roof Contractor's (Installer's) written certification from the Roof Membrane Manufacturer stating that the Roof Contractor is a Certified or Licensed Installer of the Roof Membrane Manufacturer.
   b. Experience: Three (3) copies of Installing Contractor's recent experience with the selected membrane system.

c. Roofing Contractor's written certification of consecutive exclusive experience with the membrane signed by the Roof Membrane Manufacturer's local representative.

6. Roof Membrane Manufacturer's Installation Certification: Roof Membrane Manufacturer's Installation Certification showing compliance with the specified requirements.
7. Roofing Warranty: Copies of the Roofing Warranty in the form and content (terms) indicated, covering the roofing system and associated work indicated herein, signed by the Roofing Contractor (Installer) and the Manufacturer of the Roofing System.
8. Sustainable Submittals:
   a. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   b. Product Data: For products and materials that comply with requirements for regional materials, documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 PROJECT CONDITIONS

A. Preconstruction Meeting:
   1. Arrange a meeting at the site with the Architect. Require Subcontractors and Roof System Manufacturers' Representative to attend.
   2. Review project requirements (Drawings, Specifications and other Contract Documents).
   3. Review required submittals, both completed and yet to be completed.
   4. Substrate:
      a. Review condition of substrate work, including curing and drying, structural loading limitations of the existing roof deck construction and similar considerations.
      b. Verify moisture content of concrete as being acceptable to the manufacturer before applying roofing. Verify that a minimum drying period of 14 days has been completed prior to installation of materials.
   5. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
   6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions including the possibility of temporary conditions.
   7. Review regulations concerning health code compliance, environmental protection, health, safety, materials and similar considerations.
   8. Review procedures needed for protection of roofing during remainder of construction period.
   9. Review procedures required for protection of walls, and other finish construction and surfaces which will be installed at the time of roof membrane installation.
   10. Review procedures for transporting new materials from street level to roof, placement on the roof and space available for street unloading.
   11. Review availability of each part of building, access requirements, noise and dust control.
   12. Establish a schedule for time for each area of work to be started and completed.

B. Weather Conditions: Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with requirements and the roof membrane manufacturer's recommendations.

C. Sequencing Protection:
   1. Sequence operations to avoid exposure of work on the building to the elements.
   2. Provide protection from the elements.
   3. Provide protection of construction from damage by the construction operations. Repair or replace construction so damaged to conditions of construction before damage.

D. Protection:
   1. Protect roof areas crossed during work activities and rectify any roofs affected by activities.
   2. Install roofing during dry weather and when atmospheric temperature is above 40 degrees F. Provide necessary protection and temporary covering of adjacent finished work to avoid damage by staining, spillage or otherwise until completion of roofing. Verify that ducts, piping, curbs, grounds, and other penetrations have been properly installed and secured. Give work specified in other Sections, or any

other work necessary to perform concurrently with work under this Section, free access to roof areas and, when installed, flashed or otherwise treated to produce a complete and watertight installation.

3. Provide water cut-offs around all exposed roofing at end of day's Work. Remove cut-offs before starting work next day.
4. Protection of Walls: Provide the following during the installation of roof system:
   a. Cover and protect completed wall construction, including windows and doors, with fireproof tarpaulins extending from the top of the wall down 10 ft. Secure all tarpaulins independent of the wall (do not attach to wall).
   b. Maintain wall protection during all roof construction. Remove protection from the project site after inspection and completion of roof membrane system.

1.6 WARRANTY

A. The Roof System Manufacturer's Representative is to inspect the installation of the roof system and associated work of the system prior to the start of work, during the work, and at completion of the work. Upon approval of the installation by the Roofing System Manufacturer's Representative, a total system warranty is to be issued to the Owner.

B. Provide Roofing System Manufacture's written warranty stating that the roofing system will be free of faults and defects in accordance with the General Conditions, except that the Warranty is to be extended by the Roof System Manufacturer's 20-year written warranty insuring the waterproofing performance of the installed system which has been applied on sound materials in accordance with the manufacturer's written instructions.

C. Provide a warranty covering the waterproofing performance of the roofing system, including all costs of materials and labor (No Dollar Limit), to repair and or replace the roof system and associated system materials installed on structurally sound materials.

D. Provide the warranty in writing and be signed by the Contractor, Installing Subcontractor and Roof System Manufacturer.

E. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MEMBRANE SYSTEM MANUFACTURERS

A. American Hydrotech, Inc.
B. Barrett Company.
C. Carlisle Coatings and Waterproofing, Inc.
D. CETCO.
E. Henry Company.
F. Tremco, Inc.
G. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 MEMBRANE SYSTEM MATERIALS

A. Single-Component Membrane: Subject to compliance with the requirements provide a 100 percent solids, hot-applied rubberized asphalt membrane system, one of the following:
   1. Monolithic Membrane 6125; American Hydrotech, Inc.
   2. Ram-Tough 250; Barrett Company
   3. CCW-500R, Carlisle.
   4. StrataSeal-HR, CETCO.
   5. Elasto-Seal 790-11, Henry Company
   6. TREMproof 6100, Tremco.

B. Sheet Flashing: One of the following as standard with manufacturer:
   1. 50 mil minimum, non-staining, uncured sheet neoprene with manufacturer’s recommended contact adhesives.

2. 140 mil minimum, reinforced SBS modified-bitumen sheet.

C. Membrane Reinforcing Fabric: Manufacturer's recommended spunbonded glass fiber or polyester fabric.

D. Joint Reinforcing Strip: Manufacturer's recommended spunbonded nylon or polyester fabric.

E. Protection Course: Fiberglass reinforced rubberized asphalt sheet 40 mils thick nominal thickness for roofing applications and 80 mils thick nominal thickness for waterproofing applications.

2.3 MISCELLANEOUS MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

B. Primer: ASTM D 41, asphaltic prime

C. Adhesives and Sealants: As recommended by manufacturer of roofing system.

D. Flashing and Accessories: As recommended by roofing manufacturer and as indicated.

E. Metal Counterflashing & Terminations: As recommended by manufacturer of roofing system, in addition refer to Section 07 62 00, Sheet Metal Flashing and Trim.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation until after the minimum concrete curing period recommended by roofing system manufacturer.
2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D 4263.
3. Notify Architect in writing of anticipated problems installing roof system over substrate.

B. Application of materials and related elements constitutes acceptance of the existing conditions.

3.2 PREPARATION

A. Clean and prepare substrate according to manufacturer's recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.

C. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

D. Complete detailing and flashing in accordance with manufacturer’s printed instructions prior to installation of roofing system.

3.3 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to roof membrane manufacturer's recommendations. Remove dust and dirt from joints and cracks complying with ASTM D 4258 prior to coating surfaces.

B. Prepare vertical surfaces at terminations and penetrations through roofing and at drains and sleeves according to the waterproofing manufacturer's recommendations.

3.4 FLASHING INSTALLATION

A. Install flashing sheets at terminations of roof membrane according to system manufacturer's written instructions and details.

B. Prime substrate with asphalt primer if required by roofing system manufacturer.

C. Install elastomeric flashing sheet and adhere to deck and wall substrates in a layer of hot, rubberized asphalt.

D. Install modified bituminous flashing sheet and adhere to substrate in a layer of hot, rubberized asphalt.

E. Extend flashing sheet up walls or parapets a minimum of 8 inches above insulation and 6 inches onto roof deck.
F. Install termination bars and mechanically fasten to top of flashing sheet at terminations and perimeter of roofing.

3.5 MEMBRANE INSTALLATION

A. General: Comply with manufacturer's printed instructions and details, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.
B. Heat rubberized asphalt in an oil- or air-jacketed melter with mechanical agitator specifically designed for heating rubberized-asphalt waterproofing.
C. Apply primer, at manufacturer's recommended rate, over prepared substrate and allow to dry.
D. Reinforced Membrane: Spread hot, rubberized-asphalt to a thickness of not less than 90 mils, fully embed membrane-reinforcing-fabric overlapping sheets 2 inches and spread another not less than 125 mils thick layer of hot rubberized-asphalt to provide a uniform, total reinforced, seamless membrane of not less than 215 mils thick.
E. Apply roofing over prepared joints and up wall terminations and vertical surfaces to heights indicated or required by manufacturer.
F. Testing System Integrity:
    1. Prior to installation of wearing surface, test membrane system to verify the integrity of the cured membrane. Dam drains and flood to a depth of 2 inches. Inspect underside of slabs after 48 hours. If repairs are necessary, drain and dry and re-apply membrane to the affected area.
    2. Perform localized water tests on flashing and penetrations.
    3. Test roofing system again and repeat the above until no leaks are detected.
G. Patching and Repair:
    1. Provide patching and repairing of roofing system damaged by other trades after installation as the work of section. Repair and patch the installed membrane in accordance with the printed instructions of the manufacturer.
    2. Costs for such repair and patching are to be borne by the trade or subcontractor causing such damage. The General Contractor will coordinate costs of repair work between the subcontractors or contractors for this repair and patch work at no additional cost to the Owner for such work.

3.6 FIELD QUALITY CONTROL

A. The Architect and Roof System Manufacturer's Representative will determine during the course of the roofing work whether the material, installation and the workmanship used in the work actually comply with the requirements of the Contract Documents and the Quality Assurance article as stated in this section.
B. Owner will engage an independent testing agency to perform field inspections, sample and test materials being used, observe flood tests, and report whether tested Work complies with or deviates from requirements. Independent testing agency will complete the following:
    1. Verify thickness of roofing membrane.
    2. Witness and examine underside of slabs and terminations for evidence of leaks during flood testing.
C. Deficiencies:
    1. Where inspections indicate deficiencies in the work, or non-compliance with this specification and the Roof System Manufacturer's specifications, prepare recommendations for additional or remedial work to compensate for deficiencies. The Architect and Roof System Manufacturer's Representative will review recommendations prior to proceeding with remedial work.
    2. When directed in writing by the Architect, proceed with additional or remedial work as required to compensate for deficiencies at no additional cost to the Owner.

3.7 CLEANING

A. Remove trash debris, equipment and excess materials from the building and site.
B. Remove stains, roof system and other roofing materials from all finish building surfaces, walks, paving and landscaped areas of the site. Restore finishes and grounds to their original condition. Replace all such construction which cannot be successfully cleaned, repaired or refinished at no additional cost to the Owner.

3.8 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures roof system work being without damage or deterioration at time of substantial completion.

END OF SECTION

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SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Formed wall sheet metal flashing fabrications.
B. Related Work:
   1. Section 04 22 00 - Concrete Unit Masonry.

1.3 PRE-INSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.
C. Shop Drawings: For sheet metal flashing and trim.
   1. Include plans, elevations, sections, and attachment details.
   2. Distinguish between shop- and field-assembled work.
   3. Include identification of finish for each item.
   4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
D. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Product certificates.
B. Product test reports.
C. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
B. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.
   1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

B. Solder:
1. For base materials a mixture of tin and lead [with maximum lead content of 0.2 percent.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2-inch-wide and 1/8-inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

2.6 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams. Fabricate from the following materials:
1. Stainless Steel: 0.016 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill 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:
1. Stainless Steel: 0.016 inch thick.

C. Wall Expansion-Joint Cover: Fabricate from the following materials:
1. Stainless Steel: 0.019 inch thick.

PART 3 – EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.2 INSTALLATION, GENERAL

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, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous 1 coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
   1. Do not use torches for soldering.
   2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
   3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.3 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.
C. Clean off excess sealants.
D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION

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SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

1.3 PRE-INSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
   1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product test reports.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
    1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
    2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
        a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
        b. Classification markings on penetration firestopping correspond to designations listed by the following:
            i. UL in its "Fire Resistance Directory."
C. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

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

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
    1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
    2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
        a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
            i. UL in its "Fire Resistance Directory."
            ii. Intertek Group in its "Directory of Listed Building Products."
            iii. FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   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. 3M Fire Protection Products:
      b. Hilti, Inc.
      c. Tremco, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings 1 determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
   3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
   1. Sealant shall have a VOC content of 250 g/L or less.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

2.3 TELECOMMUNICATIONS AND ELECTRICAL APPLICATIONS

A. Cable Bundling Protection:
   1. Composite Sheet (Intumescent): The intumescent sheet shall be capable of passing ASTM E 814 (ANSI/UL 1479) Standard Method of Fire Tests for Through-Penetration Fire Stops up to the desired fire resistance rating.
   2. Basis of Design: 3M CS-195+ Composite Sheet.
   3. Systems Components:
      a. Fire barrier caulk or putty.
      b. Fire barrier wrap strip.
      c. Graphite intumescent seal.
      d. Sheet metal, anchors, washers and screws.
      e. Cardboard.
   4. Single Cable Tray - Wall (One and Two-Hour Wall): Based on W-L-40004.
   5. Single and Multiple Cable Trays – Concrete Floor (One and Two Hours): Based on C-AJ-4003.
   6. Single Cable Tray – Concrete Curb Retrofit (One and Two Hours): Based on F-B-3004.

2.4 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric 1 sealants of grade indicated below:
    1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and non-sag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of non-sag grade for both opening conditions.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
    1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
D. Install fill materials by proven techniques to produce the following results:
    1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
    2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
    3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
    1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
    1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
    2. Contractor's name, address, and phone number.
    3. Designation of applicable testing and inspecting agency.
    4. Date of installation.

5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

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SECTION 07 92 00
JOINT SEALANTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Non-staining silicone joint sealants.
   3. Mildew-resistant joint sealants.
   4. Latex joint sealants.

B. Related Work:
   1. Section 07 18 16 “Vehicular Traffic Coatings: For sealants in conjunction with parking garage traffic coatings.

1.3 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples: For each kind and color of joint sealant required.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Product test reports.
B. Preconstruction laboratory test reports.
C. Preconstruction field-adhesion-test reports.
D. Field-adhesion-test reports.
E. Sample warranties.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.8 WARRANTY

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

PART 2 – PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. VOC Content: Sealants and sealant primers shall comply with the following:
   1. Architectural sealants shall have a VOC content of 250 g/L or less.
   2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
   3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NON-STAINING SILICONE JOINT SEALANTS

A. Non-staining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
B. Silicone, Non-staining, S, NS, 50, NT: Non-staining, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

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. Dow Corning Corporation.
   b. Pecora Corporation.
   c. Sika Corporation; Joint Sealants.
   d. Tremco Incorporated.
   e. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 50, T, NT: Single-component, non-sag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.
   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. BASF Corporation; Construction Systems.
      b. LymTal International Inc.
      c. GE Performance Coatings, 9930 Kincey Avenue, Huntersville, NC 28078; Tel: (877) 943-7325; Website: www.siliconeforbuilding.com.
      d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.4 IMMERSIBLE JOINT SEALANTS

A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, Class 1; tested in deionized water unless otherwise indicated
B. Urethane, Immersible, S, P, 50, T, NT, I: Immersible, single-component, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T, NT, and I.
   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. Sika Corporation; Joint Sealants.
      b. Tremco Incorporated.
      c. W. R. Meadows, Inc.
      d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
B. Silicone, Mildew Resistant, Acid Curing, S, NS, 50, NT: Mildew-resistant, single-component, non-sag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   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. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      c. Tremco Incorporated.
      d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
C. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   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. BASF Corporation; Construction Systems.
      b. Pecora Corporation.

c. Tremco Incorporated.
d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.6 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
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. Alcot Plastics Ltd.
b. BASF Corporation; Construction Systems.
c. Construction Foam Products; a division of Nomaco, Inc.
d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 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 5 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
   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.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.4 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Joints in stone paving units, including steps.
      c. Joints between different materials listed above.
      d. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, M, P, 50, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
   1. Joint Locations:
      a. Joints in pedestrian plazas.
      b. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, immersible, S, P, 50, T, NT, I.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry.
      c. Joints in dimension stone cladding.
      d. Joints between stone or masonry exterior envelope components/assemblies and window and door frames and/or subframes.
      e. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, non-staining, S, NS, 50, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
   1. Joint Locations:
      a. Isolation joints in cast-in-place concrete slabs.
      b. Control and expansion joints in tile flooring.
      c. Other joints as indicated on Drawings.
   2. Joint Sealant: Urethane, S, P, 50, T, NT.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Tile control and expansion joints.
      c. Vertical joints on exposed surfaces of unit masonry walls and partitions.
      d. Joints on underside of plant-precast structural concrete
      e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.
2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal work.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

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

1.5 PRE-INSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.
C. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
D. Samples for Initial Selection: For units with factory-applied color finishes.
E. Samples for Verification: For each type of exposed 1 finish required.
F. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

1.7 INFORMATIONAL SUBMITTALS

A. Product test reports.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Amweld Building Products, LLC.
   2. Curries Company; ASSA ABLOY.
   3. LaForce, Inc.
   4. Steelcraft; an Allegion brand.
   5. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
   1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. At locations indicated in the Door and Frame Schedule.
   1. Physical Performance: Level A according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches.
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
      d. Edge Construction: Model 1, Full Flush.
      e. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
      f. Core: Manufacturer's standard vertical steel-stiffener core.
         i. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   3. Frames:
      a. Materials: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch.

b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Full profile welded.
4. Exposed Finish: Factory Prime.
5. Frame product for installation in masonry walls with door openings greater than 48 in. (1219 mm) in width shall have a steel angle or channel stiffener factory welded into the head, when the head is to be grouted. Such stiffeners shall be not less than 0.093 in. (2.3 mm) in thickness, not longer than the door opening width, and shall not be used as lintels or load bearing members.
6. Provide modular frames with 4-inch nominal headers for door openings in modular masonry construction that otherwise would not align (at headers) with masonry coursing.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule.
1. Doors:
a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
d. Edge Construction: Model 1, Full Flush.
e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Polyurethane.
i. Fire-Rated Core: Manufacturer's standard vertical steel stiffener with insulation core for fire-rated doors.
2. Frames:
a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
b. Construction: Full profile welded.
c. Frame product for installation in masonry walls with door openings greater than 48 in. (1219 mm) in width shall have a steel angle or channel stiffener factory welded into the head, when the head is to be grouted. Such stiffeners shall be not less than 0.093 in. (2.3 mm) in thickness, not longer than the door opening width, and shall not be used as lintels or load bearing members.
d. Provide modular frames with 4-inch nominal headers for door openings in modular masonry construction that otherwise would not align (at headers) with masonry coursing.
3. Exposed Finish: Prime.

2.5 BORROWED LITES

A. Hollow-metal frames of uncoated steel sheet, minimum thickness of 0.053 inch.
B. Construction: Full profile welded.

2.6 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042-inch-thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
F. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
I. Glazing: Section 08 80 00 "Glazing."
J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
B. Hollow-Metal Doors:
   1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
   2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
   4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
   5. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
         i. Two anchors per jamb up to 60 inches high.
         ii. Three anchors per jamb from 60 to 90 inches high.
         iii. Four anchors per jamb from 90 to 120 inches high.
         iv. Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
      b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
         i. Three anchors per jamb up to 60 inches high.
         ii. Four anchors per jamb from 60 to 90 inches high.
         iii. Five anchors per jamb from 90 to 96 inches high.
         iv. Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

c. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow metal work for hardware.

E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow-metal work.
   5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: SDI A250.10.

2.10 ACCESSORIES

A. Louvers: Provide sight-proof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
   1. Fire-Rated Automatic Louvers: Movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.

B. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, side-lites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

g. Field apply bituminous coating to backs of frames that will be filled with grout containing anti-freezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Section 111200 – Parking Control Equipment.

1.2 SUMMARY

A. Section Includes:
   1. Interior insulated service doors.
B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

PART 2 – PRODUCTS

2.1 DOOR ASSEMBLY

A. Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
C. Door Curtain Material: Aluminum.
D. Door Curtain Slats: Flat profile slats of 1-7/8-inch to 2-5/8-inch center-to-center height.
    1. Door Finish: Aluminum Finish: Baked-Enamel or Powder-Coat Finish.
    2. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.
E. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8-inch-thick; fabricated from, aluminum extrusions and finished to match door.
F. Hood: Match curtain material and finish.
    1. Shape: Round.
    2. Mounting: As shown on Drawings.
G. Locking Devices: Equip door with locking device assembly.
    1. Locking Device Assembly: locking bars, operable from outside with cylinders.
    2. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.
H. Electric Door Operator:
    1. Usage Classification: Light duty, up to 10 cycles per hour.
    2. Operator Location: As shown on Drawings.
    3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
    4. Motor Exposure: Interior.
    5. Emergency Manual Operation: Push-up type.
    6. Control Station(s): Where shown on Drawings.
    7. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
    1. Aluminum Door Curtain Slats: ASTM B 209 sheet or ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
    2. Curtain R-Value: 4.5 deg F x h x sq. ft./Btu.
    3. Insulated-Slat Interior Facing: Metal.
B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.
C. Weather-seals for Doors: Equip each door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.

2.3 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.4 CURTAIN ACCESSORIES

A. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.5 COUNTER BALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
   1. Comply with NFPA 70.
   2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
B. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
   1. Electrical Characteristics:
      a. Phase: Single phase.
      b. Volts: 115 V.
      c. Hertz: 60.
   2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
   3. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
   4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
C. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

D. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
   1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

E. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

F. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

G. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

H. Parking Entrance Door Controls: Door contacts activation equipment will be provided and installed by Owner's Parking Access Equipment Company (HUB). Refer to Parking drawings.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

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

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of coiling-door Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
   1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

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SECTION 08 35 16
FOLDING GRILLES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Side-folding aluminum grilles.
   2. Operating hardware and supports.

B. Related Sections:
   1. Division 01: Administrative, procedural, and temporary work requirements.
   2. Section 087100 - Door Hardware.

1.2 PERFORMANCE REQUIREMENTS

A. Manufacture's pocket to fit flush within a 6-inch steel stud wall.

B. All locking posts shall allow for horizontal sway without pressure to side walls of track from trollies while opening and closing the curtain.

C. All post's standard locking hardware and handles shall be flush within post with exceptions for exit hardware.

1.3 REFERENCES

A. ASTM International (ASTM) B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.4 SUBMITTALS

A. Submittals for Review:
   1. Shop Drawings: Indicate track layout and dimensions including pocket, required curves, types and locations of posts, required locking and hardware, options, finish and installation details.
   2. Product Data: Provide information on grille construction, components, materials, and finishes.

B. Sustainable Design Submittals:
   1. Recycled Content.
   2. Regional Materials – not applicable.

C. Closeout Submittals:
   1. Operation and Maintenance Data

1.5 WARRANTIES

A. Provide manufacturer's 2-year warranty against defects in materials and workmanship.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of design: Dynamic Closures Corporation. (www.dynamicclosures.com)
B. Equivalent products by the following manufacturers are acceptable:
   1. CHI Overhead Doors. (www.chiohd.com).
   2. Overhead Door Corp. (www.overheaddoor.com).
   3. Wayne-Dalton Corp. (www.wayne-dalton.com).
   4. Woodfold Manufacturing, Inc. (www.woodfold.com).
C. Substitutions: Per Section 012513 – Product Substitution Procedures.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B221, 6063-T5 or T6 alloy and temper.

2.3 COMPONENTS

A. EZ Grille curtain:
   1. 4.25 inches (108mm) wide with 2 inch (51mm) high bottom and top plates, truss-like aluminum.
   2. Panels connected with 1/8 x 5/8 x 4-1/4-inch aluminum links vertically spaced 15 inches apart onto 5/16 inch aluminum horizontal rods spaced 3-1/2 inches on center and covered by 1/2 inch aluminum tubes. Curtain secured to pocket, not end post required.
   3. Pattern: Straight
B. Pocket: To fit flush within a 6-inch (152mm) steel stud wall. Welded 0.5-inch (13mm) tubular steel frame forming 6-inch (152mm) exterior with 1 inch (25mm) vertical adjustment. Grilles to fit within 5 inch (127mm) clear opening of pocket. Pocket door clear anodized aluminum with full height integrated handle.
C. Operation: Manual push/pull. Provide pull straps on openings over 9 feet (2743mm) in height and countertop applications.
D. Curtain Carriers: Dual bearing trolleys with 1.125-inch (29mm) diameter tires.
E. Overhead Track: Extruded aluminum, 1.375 inches (35mm) wide x 1.675 inches (43mm) high, continuous profile seamed with alignment bars and track pins at splices.
F. Curves: Detailed type and location on drawing if required.
G. Locking Post: Extruded aluminum, all post's standard locking hardware and handles shall be flush within post with exceptions for exit hardware. Locks may be on the public side, secure side or both except for intermediate posts. All lock rods engaging stainless steel floor or counter sockets shall be stainless steel. All locking posts shall allow for horizontal sway without pressure to side walls of track from trollies while opening and closing the curtain. Refer to detailed drawing for location and type of posts. Post type and location detailed on drawing.
H. Wall Channel: A floor to track extruded aluminum channel that the hookbolt fits and locks into. This channel is secured permanently to the wall.
I. HookBolt Lead: This post has a hookbolt that secures it to the Wall Channel. Additional top locking or double hookbolt locking available.
J. Bi-Part: A pair of posts that lock together with a hookbolt with an added lock rod to keep the curtain in place. It is used to separate larger doors into manageable sections, or to split the door to stack in two different directions. The concealed lock rod engages into a floor or counter socket. Doors should have at least one Bi-Part for every 30 feet (9144mm) of width. Top Lock available.
K. Top & Bottom: Lead or Trailing End option. This post contains spring loaded lock rods that engage a floor or counter socket with the bottom rod and the top rod engages into the track and header. They are unlocked with a keyed cylinder, thumb turn or paddle, both disengaging in one motion. A rubber bumper is the standard leading edge but may also have a 4-inch (102mm) flange.
L. Intermediate: A middle post in a door located between door sections, containing a spring-loaded lock rod that engages a floor of counter socket to keep the door in place and unlocked by a keyed cylinder or a thumb turn. Maximum straight line spacing of all posts is 10 feet (3048mm). Curves and counter top applications will require closer spacing.
M. Traveling End: The Traveling End post terminates a door inside of a pocket (storage area). It is free to travel back and forth inside of the pocket. The post self-locks into permanent header and floor stops that prevent

the door from fully leaving the pocket. A rear flange attached to the back of the post prevents reaching around.

N. Fixed End: Simply attaches the end of a door permanently to a wall of structure

O. Emergency Egress Door - Detailed latch type and location on drawing if required. Swing out 35.5 in. x 79.5 in. (902mm x 2019mm) emergency egress door within the curtain. Egress doors for open air Grilles are constructed with perforated panels. Egress doors for Closures are constructed of corresponding curtain material. Add 8 inches (203mm) to stack

2.4 FINISHES

A. Aluminum: Clear anodized standard. If required custom anodized detailed on drawing.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install assembly in accordance with manufacturer's instructions.

B. Anchor to adjacent construction without distortion or stress, level and plumb, to provide smooth operation.

3.2 ADJUSTING

A. Adjust grilles for smooth operation throughout full operating range.

END OF SECTION

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SECTION 08 36 13
SECTIONAL DOORS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes electrically operated sectional doors.
B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports.
   2. Section 11 12 00 "Parking Control Equipment" for parking control equipment interlocked to sectional doors.
   3. Section 28 10 00 “Access Control System” for access control system interlocked to sectional doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and mounting details.

2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Failure of components or operators before reaching required number of operation cycles.
      c. Faulty operation of hardware.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      e. Delamination of exterior or interior facing materials.
   2. Warranty Period: Sections warranted for ten years against cracking, splitting or deterioration due to rust-through, and seven years against separation/degradation of foam insulation. Ten years on insulation value.

PART 2 – PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Basis-of-Design Product: Subject to compliance with requirements, provide Rite-Hite Corporation Steel-Rite Sectional Door with Low Headroom or comparable product by one of the following:
   1. Clopay Building Products.
   2. Raynor.
   3. Wayne-Dalton Corp.
B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
   1. Obtain operators and controls from sectional door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction.
B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.
   1. Door shall meet or exceeds 15.2 psf windload per ANSI/DASMA 102-1996 standards in accordance with ASTM E-330-70.
   2. Testing: According to ASTM E 330 or DASMA 108 for garage doors and complying with the acceptance criteria of DASMA 108.

3. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components.
   a. Deflection of door sections in horizontal position (open) shall not exceed 1/120 of the door width.
   b. Deflection of horizontal track assembly shall not exceed 1/240 of the door height.
4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

2.3 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.
B. Operation Cycles: Door components and operators capable of operating for not less than100,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
C. Steel Sections: Zinc-coated (galvanized) steel sheet with zinc coating.
   1. Section Thickness: 2 inches.
   2. Exterior-Face, Steel Sheet Thickness: 24-gauge nominal coated thickness.
      a. Surface: Flat.
   3. Insulation: Board or foamed in place.
   4. Interior Facing Material: 24-gauge Zinc-coated (galvanized) steel sheet.
D. Track Configuration: Low-headroom track torsion springs in front of track.
E. Roller-Tire Material: Track rollers shall be casehardened inner steel races with 10-ball bearing rollers.
F. Counterbalance Type: Torsion spring.
G. Electric Door Operator:
   1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
   2. Operator Type: Jackshaft, side mounted.
   3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
   4. Motor Exposure: Exterior, dusty, wet, or humid.
   5. Obstruction-Detection Device: Automatic photoelectric sensor.
   6. Control Station: Where indicated on Drawings. Refer to control specifications.
   7. Other Equipment: Refer to control specifications.
H. Door Finish:
   1. Baked-Enamel or Powder-Coat Finish: Color and gloss matching Architect's sample.
   2. Finish of Interior Facing Material: Match finish of exterior section face.

2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
   1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weather-resistant seal, with a reinforcing flange return.
   2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.
B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch-nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch-thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.
C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.
D. Provide reinforcement for hardware attachment.

E. Board Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polystyrene or polyurethane board insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84; or with glass-fiber-board insulation. Secure insulation to exterior face sheet. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.

F. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections and the interior facing material, with no exposed insulation.

G. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.

H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.6 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, 2 inches galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances indicated on Drawings. Provide complete system including brackets, bracing, and reinforcement to ensure rigid support of ball-bearing roller guides for required door type, size, weight, and loading.
   1. Galvanized Steel: ASTM A 653/A 653M, minimum G60 zinc coating.
   2. Slope tracks at an angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.
   3. Track Reinforcement and Supports: Galvanized-steel members to support track without sag, sway, and vibration during opening and closing of doors. Slot vertical sections of track spaced 2 inches apart for door-drop safety device.
      a. For Vertical Track: Continuous reinforcing angle attached to track and attached to wall with jamb brackets.
      b. For Horizontal Track: Continuous reinforcing angle from curve in track to end of track, attached to track and supported at points by laterally braced attachments to overhead structural members.

B. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.
   1. Deep interlocking joint seals between sections and flexible vinyl astragal on bottom edge. Track-mounted side seal, rubber header seal and foam joint seal.

2.7 HARDWARE

A. General: Heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch-nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is impossible. Provide double-end hinges where required, for doors more than 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch-diameter roller tires for 3-inch-wide track.

2.8 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cables: Galvanized-steel, multi strand, lifting cables with cable safety factor of at least 7 to 1.

C. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

D. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.
E. Bumper: Provide spring bumper at each horizontal track to cushion door at end of opening operation.

2.9 ELECTRIC DOOR OPERATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Chamberlain Group, Inc. (The)
B. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
    1. Comply with NFPA 70.
    2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.
C. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
D. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.
    1. Jackshaft, Side Mounted: Jackshaft operator mounted on the inside front wall on right or left side of door and connected to torsion shaft with an adjustable coupling or drive chain.
E. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
    1. Electrical Characteristics:
        a. Phase: Single phase or Polyphase (see electrical schedules).
        b. Volts: [115][208][230][460]<Insert value> V.
        c. Hertz: 60.
    2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
    3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
    4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
    5. Use adjustable motor-mounting bases for belt-driven operators.
F. Limit Switches: Equip motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
G. Obstruction Detection Device: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
    1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
        a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
H. Emergency Manual Operation: Equip electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed35 lbf.
I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
B. Examine locations of electrical connections.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
B. Tracks:
   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.
   2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
D. Power-Operated Doors: Install automatic garage doors openers according to UL 325.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
B. Lubricate bearings and sliding parts as recommended by manufacturer.
C. Adjust doors and seals to provide weather-resistant fit around entire perimeter.
D. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION

SECTION 08 38 13
FLEXIBLE STRIP DOOR

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Flexible Strip Door

1.2 SUBMITTALS

A. Reference Section 01 33 23 – Submittals; submit the following items:
   1. Product Data.
   2. Shop Drawings: Show fabrication details and anchorage.
   3. Quality Assurance/Control Submittals:
      a. Manufacturer's Installation Instructions.
      b. Manufacturer's storage and handling instructions.
   4. Closeout Submittals:
      a. Cleaning and Maintenance instructions.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Regular manufacturer of flexible strip doors for at least five years.

1.4 DELIVERY STORAGE AND HANDLING

A. Reference Section 01 60 00–Product Requirements.
B. Store per manufacturer's recommendations until ready for use.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Aleco Division E.S. Robbins Corp.; 2720 E. Avalon Ave., Muscle Shoals, AL. Telephone: (800) 633-3120, (256) 248-2402. Fax: (800) 750-9616. Website: www.aleco.com.
   1. Model: Clear-Flex II Strip Door System.
B. Chase Doors: A Senneca Company; 10021 Commerce Park Drive; Cincinnati, OH. Telephone: (800) 543-4455, (513) 860-5565. Fax: (800) 245-7045. Website: www.chasedoors.com.
   1. Model: Econo Max Strip Doors.

C. Bird-B-Gone; 15375 Barranca Parkway, Unit D, Irvine, CA. Telephone: (800) 392-6915, (949) 472-3122. Fax: (949) 472-3116. Website: www.birdbgone.com.
   1. Model: Vinyl Strip Doors.

2.2 COMPONENTS

A. Strips:
   1. Formulation: Standard PVC
   2. Color: Clear
   3. Type: Scratch-resistant or ribbed.
   4. Size/Overlap: 8” x .080 / 50%

2.3 ACCESSORIES

A. Offset Bracket Kit.
B. Horizontal Slide Kit.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine opening in which door will be installed.
B. Coordinate with responsible entity to perform corrective work on unsatisfactory conditions.
C. Commencement of work by installer is acceptance of opening conditions.

3.2 INSTALLATION

A. Follow manufacturer’s instructions.

3.3 ADJUSTING

A. Follow manufacturer’s instructions as required to:
   1. Align strips to ensure most effective seal; field adjust and modify as required for proper fit.

3.4 CLEANING

A. Clean surfaces soiled by work as recommended by manufacturer.
B. Remove surplus materials and debris from the site.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Interior storefront framing.
   2. Interior manual-swing entrance doors and door-frame units.

1.3 PRE-INSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
D. Samples: For each exposed finish required.
E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

1.5 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.
B. Product test reports.
C. Field quality-control reports.
D. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
    1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
    1. Warranty Period: 10 years from date of Substantial Completion.
B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
    1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
    1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
    2. Failure also includes the following:
        a. Thermal stresses transferring to building structure.
        b. Glass breakage.
        c. Noise or vibration created by wind and thermal and structural movements.
        d. Loosening or weakening of fasteners, attachments, and other components.
        e. Failure of operating units.
B. Structural Loads:
    1. Other Design Loads: 5 psf for interior storefront loads.
C. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
    1. Fixed Framing and Glass Area:
        a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
    2. Entrance Doors:
        a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
3. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. EFCO Corporation.
2. Kawneer North America.
3. Tubelite Inc.

2.3 INTERIOR STOREFRONT FRAMING

A. Basis of Design: Kawneer North America; TriFab 451-Series, front glazed, with SSG in selected locations, per the drawings.
B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Non-thermal.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Baked-enamel finish.
5. Fabrication Method: Field-fabricated stick system.
C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
E. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Wide style. 5 inches wide stile. Coordinate with hardware space requirement. **Bottom rails to be 10-inch high minimum unless automatic door operator is provided.**
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
a. Provide non-removable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."

2.6 GLAZING

A. Glazing:
1. Insulated Glass Units with black spacers.
2. Low-E coating on second face.
a. Basis of Design: Vitro, Solar Ban 70XL.

3. Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

1. Sealant shall have a VOC content of 250 g/L or less.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Doors: Reinforce doors as required for installing entrance 1 door hardware.

F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils.

1. Color and Gloss: Match Architect's sample.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 92 00 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08 80 00 "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION

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SECTION 08 42 26

AUTOMATIC SLIDING ENTRANCE DOORS

PART 1 – GENERAL

1.1 SUMMARY

A. Electro-mechanical automatic sliding entrance doors as shown on the Drawings and specified herein, including sidelites, operating equipment and sensing controls.

1.2 QUALITY ASSURANCE

A. Comply with all laws, rules and regulations of governmental authorities having jurisdiction over this part of the work.
B. Comply with the applicable documents of the following:
   1. National Association of Architectural Metal Manufacturers (NAAMM)., Metal Finishes Manual (current edition).
   2. AAMA American Architectural Manufacturers Association, Document 2604.
C. Provide automatic door equipment which is Underwriters Laboratory Inc. (UL) listed and comply with U.L. 325 Standards.
D. Comply with ANSI A 156.10.
E. Manufacturer's Qualifications: Provide door units produced by a firm with not less than 5 years successful experience in the fabrication of automatic doors of the type required for this project.
F. Installer's Qualifications: Installer must be an authorized representative of the automatic door manufacturer for both the installation and maintenance of the type of units required for the project.
G. Glass:
   1. Glazing Material:
      a. FS DD-G-451D.
      b. ANSI Z97.1.
      c. ASTM C 1036.
   2. Safety Glazing:
      a. ASTM C 1048.
      b. ASTM C 1172.
      c. ANSI Z97.1, Class B.
      d. U.S. Consumer Product Safety Commission Standard 16 CFR 1201, Category CII.
      e. Glass Association of North America - Glazing Manual and Laminated Glass Design Guide.

H. Unless otherwise shown or governed by other referenced standards specified, conform to details and procedures of GANA Glazing Manual, current edition.
I. Source Limitations:
   1. Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
   2. Tempered Glass: Obtain tempered glass units from one manufacturer using the same type of glass and tempering process for all units.
J. In the event of a conflict between specified standards or references the more stringent or greater is to take precedent and be the one utilized for the design and installation.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:
   1. Manufacturer's Literature: Material and equipment description, installation, and maintenance and operating instructions.
   2. Shop Drawings:
      a. Plans and elevations of each type of installation. Include large scale details of head, jamb and sill, showing equipment, devices and accessories. Indicate anchors, fasteners and their spacing, show adjacent construction.
      b. Show glass thickness and glazing details.
      c. Wiring Diagrams: Show complete system wiring and locations of equipment and control devices. Include details with dimensions and product literature for control devices to be located in the building construction.
   3. Samples:
      a. Three (3), 12-inch x 12-inch samples of each type glass.
      b. Three (3), 6-inch lengths of glazing tape.
      c. One (1) set of color samples of glazing sealant for each type of sealant used.
      d. Three (3), 6-inch x 6-inch pieces each of aluminum and stainless-steel with specified finishes.
   4. Warranties: 3 signed copies for the following:
      a. Automatic sliding entrance doors and equipment.
      b. Paint finish.
   5. LEED Submittals:
      a. LEED Credit MR 4: Submit product data for products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
      b. LEED Credit MR 5: Submit product data for products and materials that comply with requirements for regional materials, documentation indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
      c. LEED Credit IEQ 4.1: Submit product data for adhesives, sealants and sealant primers applied on site and used inside the weatherproofing system, include printed statement of VOC content.
      d. LEED Credit IEQ 4.2: Submit product data for paints and coatings applied on site and used inside the weatherproofing system, include printed statement of VOC content.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver entrance doors and equipment to the project site when adjoining construction has progressed for a timely installation of components.
B. Store doors and equipment in accordance with the manufacturer's instructions, above ground, in dunnage and protected for construction activities and other causes of damage or loss.
C. Handle doors and equipment at the project site in such a manner as to prevent damage. Immediately remove damaged or otherwise unsuitable components when so ascertained.

1.5 WARRANTIES

A. Automatic Doors:

1. Provide manufacturer's written warranty stating that the complete automatic sliding entrance door installation including all sealant work will be free of faults and defects in accordance with the General Conditions, except the warranty period is to be for two (2) years.
2. Provide warranty signed by the Contractor, Subcontractor and Automatic Entrance Manufacturer.

B. The above warranties are in addition to, and not a limitation of other rights the Owner may under the Contract Documents.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design automatic entrances.

B. Structural Performance: Automatic entrances shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Wind Loads: As indicated on Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 degrees F, ambient; 180 degrees F, material surfaces.

D. Operating Temperature Range: Automatic entrances shall operate within minus 20 to plus 122 degrees F.

E. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 1.25 cfm/sq ft of fixed entrance-system area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq ft.

F. Opening Force:
1. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails, and not more than 15 lbf required to open door to minimum required width.
2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for a breakaway door or panel to open.

G. Entrapment-Prevention Force:
1. Power-Operated Sliding Doors: Not more than 30 lbf required to prevent stopped door from closing.

2.2 ACCEPTABLE MANUFACTURERS

A. Horton Automatics.

B. Stanley Magic-Door, Division of the Stanley Works.

C. Dor-O-Matic Division of Republic Industries, Inc.

D. Dorma Automatics.

E. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.3 MANUFACTURED UNITS

A. Basis of Design Product: Series 2500, Horton.

2.4 ALL-GLASS SLIDING AUTOMATIC ENTRANCES

A. Bi-parting-sliding units.
1. Configuration: Bi-parting-sliding doors with two sliding leaves and sidelites on each side.
   a. Traffic Pattern: Two way.
   b. Emergency Breakaway Capability: Sliding leaves only.
   c. Mounting: Between jambs.

2.5 MATERIALS

A. Stainless-Steel: Grade and type designated below for each form required:
1. Bars and Shapes: ASTM A 276, Type 304.

2. Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304; minimum 0.062-inch-thick, except minimum 0.04-inch-thick for cladding.
3. Tubing: ASTM A 554, Grade MT 304; minimum 0.125-inch wall thickness.
4. LEED Requirements: Provide at least 70 percent post-consumer recycled steel content produced within 500 miles of the site.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use indicated, complying with standards indicated below for each form required:
1. Extruded Bars and Shapes: ASTM B 221, 6063-T5 alloy; minimum 0.125 inch thick.
2. Extruded Tubes: ASTM B 429.
3. Drawn Seamless Tubes: ASTM B 48.
4. LEED Requirements: Provide at least 40 percent post-consumer recycled steel content produced within 500 miles of the site.

C. Steel Reinforcing and Supports: Manufacturer's standard, ASTM A 36 plate, shapes, and bars; or ASTM A 366 sheet.
1. LEED Requirements: Provide at least 90 percent post-consumer recycled steel content produced within 500 miles of the site.

D. Fasteners: Manufacturer's standard, of same basic metal as fastened metal, unless otherwise indicated.

E. Clear Float Glass: Complying with ASTM C 1036, Type I, Class 1, Quality q3, thickness as shown or specified, tempered in doors and adjacent lights where shown on Drawings or required by codes, one of the following:
1. Clear Float Glass, AFG.
2. Clear Glass, Guardian.
3. Clear, Pilkington.
4. Clear Glass, PPG Industries.
5. Clear Glass, Viracon.
6. Clear Glass, Visteon.

F. Spacer Blocks: Neoprene, 40-50 Shore A hardness.

G. Glazing Gaskets: Extruded P.V.C.
1. Sustainable Requirements: VOC content of joint sealants used inside the weatherproofing system shall not exceed 250 g/L.

H. Glazing Tape: Reinforced polyisobutylene butyl tape.

I. Glazing Sealant: One-part silicone, FS-TT-S-00230, Type II, Class A.

J. Weatherstripping: Double weatherstrip head, jamb and meeting rails with silicone coated woven pile with mylar side or center fins. Double weatherstrip sill with two neoprene bulb type weatherstrips to seal between sill or fixed lite insert and threshold insert.

K. Insulating Glass Units:
1. Provide units manufactured, tested and approved in accordance with SIGMA requirements. Provide units warranted for ten (10) years by the manufacturer against material obstruction of vision resulting from film restoration or dust collection between glass surfaces.
2. Unless shown or noted otherwise on the Drawings, provide units consisting of minimum 1/4-inch glass (clear or clear with Low - E coating) outboard lite plus 1/2-inch air space plus minimum 1/4 inch clear float glass inboard lite. Provide tempered and/or heat strengthened units as required conditions of the installation and/or code requirements.

L. Glazing Gaskets and Compression Weatherstripping: Manufacturer's standard elastomeric molded neoprene, ASTM D 2000; Des. 2BC415 to 3BC415 or molded PVC, ASTM D 2287, complying with AMAA SG-1.

M. Sealants:
1. Provide sealants required within the door and sidelite units of elastomeric type as recommended by the door and sidelite manufacturer.
2. Door Unit Perimeter Sealants: Refer to Section 07 92 00, Sealants.

N. Door Hardware: Door manufacturer's standard U.L. listed security lock with thumb turn inside and standard cylinders outside. **Coordinate cylinder type and keying with Owner.**

2.6 DOOR AND FRAME FABRICATION

A. Frame Assembly:

1. Fabricate door frames with continuous minimum 4-inch-wide extruded aluminum header with four concealed ball bearing wheels on nylon covered support track.
2. Provide track which is replaceable without removing operator.
3. Provide concealed guides to stabilize bottom of door and continuous extrusion to prevent derailing of door for full length of door travel.
4. Square cut, cope and drill door and sidelite frame extrusions to receive non-corrosive fasteners at each corner.
5. Fabricate members from extruded aluminum with stainless steel cladding.

B. Door panels:
1. Fabricate door panels with tongue and groove key fitted gussets with two tempered non-corrosive bolts in each corner section.
2. Provide each sliding door with spring to reclose door if pushed open (swing position).
3. Fabricate members from extruded aluminum with stainless steel cladding.

2.7 EQUIPMENT

A. System Operation:
1. Operate automatic sliding entrance doors by a self-contained electro-magnetic mechanical unit concealed and mounted in the head of the door.
2. Provide door panels which swing out 90 degrees from any position of slide movement and be U.L. listed as an exitway.
3. Provide motor equipped with automatic reset thermal overload protection.
4. Power requirements for door equipment are; 115 Volt, 1-Phase, 60 HZ, 15 Amp.

B. Belt Drive Operator:
1. Provide an electromechanical, utilizing a permanent magnet motor with gear transmission and belt drive. Provide header mount operator and conceal with a securely attached, hinged cover. Provide belt drive consisting of a steel stranded polyurethane and nylon, 1 inch wide.
2. Provide full independent adjustable opening speed, closing speed, back check and latch check. Provide operator microprocessor master control including programming for specified functions and readout for diagnostics.
3. Provide revolution counter to memorize and continuously recheck the door's position and to issue instruction for the functions of partial opening (optional) and check the door's speed.
4. Provide closing speed not exceeding 12 inches per second. Provide opening speed capable of opening a bi-parting door at a rate of 60 inches per second for doors weighing 300 lbs or less.
5. Provide operator that will reverse when maximum force of 28 lbs is exerted to prevent the door from closing. Provide reverser field adjustable to meet job conditions.
6. For protection in case of electrical power failure, provide operator to revert to free manual operation of the door. Provide a power ON/OFF switch located on the inside of the header to serve a second function as hold open for door when in OFF position.

C. Linear Operator:
1. Equip each door with operators consisting of a magnet motor and linear actuator drive mounted in the door head. Provide operator with adjustments for closing speed, opening speed, back check, latch check and time delay from 1 to 28 seconds.
2. Include in operator automatic pressure relief in case of electrical power failure to prevent door closing on pedestrians.
3. There are to be no springs or mechanisms to prevent free manual operation of doors. Provide operator with ON and OFF switch located inside the frame head which also functions as a hold open for the doors.
4. The operator is to reverse the travel of the doors when a maximum pressure of 15 lbs. is exerted to prevent the door from closing. Provide this feature adjustable for varying conditions.

D. Controls:
1. Provide manufacturer's standard presence and motion detectors for two-way control of the doors. Provide motion detectors mounted on the head of each door frame on both sides of door to open the doors.
2. Provide a wide beam presence sensor mounted in the door unit sidelite to prevent the doors from closing when a person is standing still in the doorway.

3. In addition, install photo-electric sensor lights parallel to each opening to re-open doors should a person re-enter the door when it is closing.
4. Provide a cut-off switch in the door operator to disconnect the outside detector when one-way traffic is required.

2.8 FINISH OF STAINLESS-STEEL

A. General: Remove tool and die marks and stretch lines or blend into finish. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
   1. Finish door units before assembly.
B. Provide Non-directional polish No. 8.
C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine all surfaces of openings and verify all opening dimensions at the project site. Fabrication and/or installation of the entrance door units and related elements constitutes acceptance of the existing conditions.

3.2 INSTALLATION

A. Comply with manufacturer's printed specifications for installation and the final reviewed shop drawings of door units, hardware, equipment and other components of work.
B. Perform all work and operations as necessary to prepare openings for proper installation of door units. Install treated wood blocking as shown on Drawings or as required for anchorage of door units.
C. Coordinate work of other sections (electrical, glass and sealants, etc.) to complete the installation of the entrance doors.
D. Set units plumb, level and true to line, without warp or rack of frames, or sash. Anchor securely in place. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action by bituminous paint of plastic shims. Assemble and anchor the various components to allow for expansion and contraction and vibrations while maintaining a watertight condition.
E. Seal perimeter joints between door frames and adjacent construction. Refer to Section 07 92 00, Sealants, for sealant and joint filler requirements.

3.3 CLEAN AND ADJUST

A. Clean door and frame surfaces and glass promptly after installation of entrance units, exercising care to avoid damage to protective coatings and finishes. Remove excess sealant compounds, dirt and other substances.
B. Adjust operation of doors, operators and controls to provide smooth quiet operation and tight fit at contact points of frame and door panels. Lubricate equipment, test and adjust controls and moving parts to ensure proper operation. Instruct Owner's maintenance personnel in operation and maintenance of equipment and controls. Provide name and telephone number to the Owner of 24-hour maintenance/repair service for automatic entrance doors.
C. Touch up finish coat system of all imperfections as recommended by manufacturer of finish coating system. Remove and replace any component or door unit that cannot be successfully repaired, at no additional cost to the Owner.
D. Initiate all protection and other precautions to ensure that entrance door units will be without damage or deterioration at time of final acceptance.

END OF SECTION

SECTION 08 44 23

STRUCTURAL-SEALANT-GLAZED CURTAIN WALLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Field-glazed, four-sided structural-sealant-glazed curtain-wall assemblies.
B. Related Requirements:
   1. Section 08 44 13 "Glazed Aluminum Curtain Walls" for conventionally glazed curtain walls.

1.3 PRE-INSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: For structural-sealant-glazed curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
   1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.

2. Include full-size isometric details of each vertical-to-horizontal intersection of structural-sealant-glazed curtain walls, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.
3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inchlengths of full-size components and showing details of the following:
1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

E. Delegated-Design Submittal: For structural-sealant-glazed curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For structural-sealant-glazed curtain walls, accessories, and components from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each structural-sealant-glazed curtain wall.

B. Product Test Reports: For structural-sealant-glazed curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain-wall assemblies.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.
2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Warranty Period: 20 years from date of Substantial Completion.

1.8 FACTORY TESTING

A. Distortion Tolerance Testing:
1. Measure each pane of monolithic heat-treated or coated glass of 6 mm thickness or more used in the Project, including glass used in visual mockups.
2. Measurement Device: Use a 3-point trolley, or equal, to measure the first 5 lites and then measure every hour to check flatness requirements for silk-screened glass, full coverage ceramic fritted glass, glass of greater than 3/8-inch thickness, or dark tinted 3/8-inch glass.
3. Roll Wave Criteria (horizontal): Maximum 0.003 Center / 0.008 Edges (Peak to Valley).
4. Millidiopter Criteria: (90 percent surface) Maximum + or – 125 A.
5. Documentation:
    a. Document and record results for each pane.
    b. Tag each pane of glass that falls outside of the maximum distortion limits and certify that these non-conforming glass panes will not be fabricated and supplied to the Project.
    c. Provide additional written documentation upon request by the Owner or Architect.
6. Bow/Warp Tolerance:
    a. Maximum 1/2 of ASTM C 1048 or 1/32 inch per lin ft, whichever is greater.
    b. Measure every hour on a vertical plane with a metal straight edge.
    c. Provide recorded written documentation upon request.

B. Preconstruction Insulating Glass Unit Requirements and Sealant and Desiccant Testing:
1. Test insulating glass units.
2. Butterfly Primary Seal Unit Adhesion Pull Testing:
    a. Adhesion Criteria: Comply with pass / fail requirements of manufacturer's published guidelines and/or manufacturer's certification audit requirements / recommendations. Minimum pull back to 30 degrees from horizontal with no significant adhesive failure.
    b. Test 1 unit each shift and after each carton change and/or project or product change.
    c. Minimum unit size 24 inches x 36 inches.
    d. Test units shall be fabricated on the same production line and processing equipment, and with the same spacers and sealant used in the production of the insulating glass units fabricated for the Project during the production of the project.
3. Desiccant Temperature Rise Testing:
    a. Test Criteria: Comply with desiccant manufacturer's written recommendations.
    b. Test a minimum of once every shift and after each drum change.
    c. Perform Residual Moisture Test: Minimum temperature rise equal to or greater than 50 degrees Fahrenheit.
4. Bow/Warp and Air Space Measurement. Concave/Convex:
    a. Measure bow warp every hour on a vertical plane with a metal straight edge.
    b. Measure center air space every hour and all units equal to or more than 35 sq ft. Measure positive/negative air within the insulating glass unit controlled to plus or minus 1/16 inch at the time of fabrication utilizing a laser, or other device acceptable to the Architect, at a minimum frequency of every hour. Visually check each unit.
5. Skips and voids in the primary or secondary seals are prohibited and maximum gap at primary/secondary seal interface is 2 inch length and 1/16 inch in width. The PIB must be continuous with a targeted width of 5/32 inch and minimum width of 3/32 inch.
6. Documentation:
    a. Document and record results.
    b. Tag each Insulating Glass Unit that falls outside of the defined limits and certify that these non-conforming Insulating Glass Units will not be supplied to the Project.
    c. Provide additional written documentation upon request by the Owner or Architect.

C. Preconstruction Glass Color Testing:
1. Measure monolithic coated glass and coated insulting glass units.

2. Establish color target and perform quality color control checks using on-line or off-line spectrophotometer instrumentation (Minolta 2500d / 2600d or equal). Color measurement taken from uncoated side in the central area. The first 15 panes / units, then measure a minimum of 1 unit every hour and each product change.
3. Tolerances for color variation shall be less than 4.5 DE or as defined in ASTM C 1376.

D. Documentation: Document and record results. Tag each pane / unit of glass that falls outside of the maximum color variation limits and certify that nonconforming glass will not be fabricated and or supplied to the Project.

1.9 MOCKUP INSTALLATION

A. General:
1. Prior to the start of fabrication, prepare and submit complete mockup drawings and structural calculations stamped by a professional engineer licensed in the State of Wisconsin, for both visual and testing mockups.

B. Visual Mockup:
1. After the Architect approves the submittal, prepare a full-size pre-production visual mockup of a typical unitized window wall assembly as shown on the Drawings for the Architects review. The mockup installation may be at either the job site or the manufacturer's plant as mutually agreed. After review of the pre-production mockup, it will be retained and used as a standard of quality for production. When utilized in the building installation, record the location of the reviewed mockup on the Record Drawings. This mockup is separate and in addition to mockup for unitized window wall testing.
2. Include in the mockup; typical glazing materials, paint and metal finishes, corner details and other details and fabrications of the unitized window wall requiring prior review before the start of fabrication.
3. Construct mockups in accordance with approved mockup shop drawings. Any deviation from or additions to details shown on drawings are subject to approval by Architect.
4. The Architect's and Owner's review of the mockup installation will be for final acceptance of paint finish, quality of assembly and detail and conformance with design and general quality prior to production and does not relieve the Manufacturer/Fabricator from the responsibility and conformance with all herein specified requirements.

C. Testing Mockup:
1. Owner will engage a qualified testing agency to perform preconstruction testing on laboratory mockups.
2. This mock-p is separate and in addition to mockups for visual review.
3. Refer to Sections 01 45 34, Quality Control for Exterior Wall Systems for additional requirements.
4. Include in the mockup; typical glazing materials, paint and metal finishes, corner details and other details and fabrications of the unitized window wall requiring prior review before the start of fabrication.
5. Construct mockups in accordance with approved mockup shop drawings. Any deviation from or additions to details shown on drawings are subject to approval by Architect. Do not use excessive amounts of sealant, nor other special measures or techniques, which are not representative of those to be used on the building.
6. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.

D. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of structural-sealant-glazed curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
1. Structural-sealant-glazed curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.
    e. Failure of operating units.

C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches 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 amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
    a. Operable Units: Provide a minimum 1/16-inchclearance between framing members and operable units.
3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inchfor spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 12 lbf/sq. ft.

H. Inter-story Drift: Accommodate design displacement of adjacent stories indicated.
1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    b. Low Exterior Ambient-Air Temperature: 0 deg F.

K. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi.

L. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
   1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
   2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

A. Source Limitations: Obtain all components of curtain-wall system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Glazing System: Retained with structural sealant on four sides.
   2. Finish: High-performance organic finish.
   3. Fabrication Method: Either factory- or field-fabricated system.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

C. Materials:
   1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Sheet and Plate: ASTM B 209.
      b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
      c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
      d. Structural Profiles: ASTM B 308/B 308M.

2.4 ENTRANCES

A. Entrances: Comply with Section 08 41 13 "Aluminum-Framed Entrances and Storefronts."
   1. Structural Profiles: ASTM B 308/B 308M.

2.5 GLAZING

A. Glazing:
   1. Insulated Glass Units with black spacers.
   2. Low-E coating on second face.
      a. **Basis of Design: Vitro, Solar Ban 70XL.**
      b. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
   3. Comply with Section 08 80 00 "Glazing."

B. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
   1. Color: As selected by Architect from manufacturer's full range of colors.

C. Weather-seal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weather-seal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.
   1. Color: Match structural sealant.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
   7. Components curved to indicated radii.

D. Factory-Assembled Frame Units:
   1. Rigidly secure nonmovement joints.
   2. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion.
   3. Preparation includes, but is not limited to, cleaning and priming surfaces.
   4. Seal joints watertight unless otherwise indicated.
   5. Install glazing to comply with requirements in Section 08 80 00 "Glazing."

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than70 percent PVDF or FEVE resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 – EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
   7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components plumb and true in alignment with established lines and grades.

D. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

E. Install glazing as specified in Section 08 80 00 "Glazing."
   1. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

F. Install weather-seal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions, to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install structural-sealant-glazed curtain walls to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
   2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inchwide, limit offset from true alignment to 1/16 inch.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inchwide, limit offset from true alignment to 1/8 inch.
      c. Where surfaces are separated by reveal or protruding element of 1 inchwide or more, limit offset from true alignment to 1/4 inch.
   4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

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

B. Test Area: Perform tests on one bay at least 30 feet, by one story] [representative areas of structural-sealant-glazed curtain walls.

C. Field Quality-Control Testing: Perform the following test on representative areas of structural-sealant-glazed curtain walls.
   1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
      a. Perform a minimum of two tests in areas as directed by Architect.
      b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10 percent completion.
   2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.50 cfm/sq. ft.

a. Perform a minimum of two tests in areas as directed by Architect.
b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10 percent completion.

3. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

D. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
1. Test a minimum of four areas on each building facade.
2. Repair installation areas damaged by testing.

E. Structural-sealant-glazed curtain walls will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

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SECTION 08 44 26
UNITIZED WINDOW WALL

PART 1 – GENERAL

1.1 SUMMARY

A. Engineered aluminum and structurally glazed unitized window wall as shown on the Drawings and specified herein including but not necessarily limited to the following:
   1. Window wall applications:
      a. Window wall system.
   2. Insulating glass units, vision and spandrel units.
   3. Structural silicone sealants.
   4. Foil-faced mineral fiber insulation behind non-vision glass areas.
   5. Connections to building structure.
   6. Structural steel reinforcing of unitized window wall framing and connections to building structure as necessary to comply with the conditions present and the performance requirements stated herein.
   7. Required glazing accessories, trim, anchors, supports, and accessories for a complete fabricated and installed system.
   8. Recessed stainless-steel window washing inserts.
   9. Light fixtures.
   10. Factory-applied paint system to exposed aluminum members and components.
   11. Aluminum or stainless-steel flashing to join system to adjacent construction to protect construction and direct the passage of moisture.
   12. Sealants in perimeter joints at abutting construction and all joints required to be sealed within the unitized window wall system assembly.
   13. Field measurements and verification of all openings and all conditions of the installation.
   14. Off-site laboratory testing of unitized window wall system mockup.
   15. Field water testing of the installed unitized window wall system including perimeter sealant joints.

B. Applicable requirements of Section 01 83 16, Exterior Wall Systems – General Requirements, apply to this Section.

1.2 PERFORMANCE REQUIREMENTS

A. The system manufacturer is responsible for the engineering and design of all components and materials, as well as the installation of the unitized window wall system.

B. The unitized window wall system includes items required for a complete system, including but is not limited to the following: structural steel framing and support members that are a part of the system, reinforcements, bracing, kickers, embedments, screws, nuts, washers, bolts, structural steel anchors, clips, glass and glazing materials and accessories, installation hardware, and sealants.

C. Interface with other systems: Coordinate unitized window wall system with the other work provided under Section 01 45 34, Quality Control for Exterior Wall Systems and Section 01 83 16, Exterior Wall Systems, General Requirements.

D. Wind Load Pressures:
   1. Design unitized window walls to perform under wind load pressures 25 lbs/sf.
   2. Submit calculations to the Architect substantiating compliance with the wind loads and conditions indicated.

E. Provision for Thermal Movements:
   1. Provide for expansion and contraction of component materials, as will be caused by an exterior ambient temperature ranging from -10 degrees F to metal surface temperature of +180 degrees F, and an interior temperature range of +50 degrees F to +100 degrees F, without causing buckling stresses on glass or stone, failure of glass, metal, stone or joint seals, undue stress on structural elements, damaging loads on fasteners, reduction of performance or other detrimental effects.
   2. Provide accommodation for movement in the design and identified on submitted shop drawings, accompanied by thermal calculations.

F. Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening or fracturing of attachments or components of system are not permitted in the installed work.

G. Provide unitized window wall which meets or exceeds the performance and test requirements specified in Section 01 83 16, Exterior Wall Systems – General Requirements.

H. Deflection Criteria: Performance criteria at design pressures and loads for metal members supporting glass are as follows:
   1. 1. Deflection Normal to Wall Plane:
      a. Spans up to 13 ft - 6 inches: Limited to 1/175 of clear span.
      b. Spans greater than 13 ft - 6 inches and less than 40 ft: Limited to 1/240 of clear span plus 1/4 inch.
   2. Span: Span is defined as the distance between anchor centerline.
      a. For cantilevers, span is defined as two times the distance between anchor centerline and end of cantilever.
      b. Where a sealant joint occurs between a framing member and a relatively stiff building element, framing member deflection is not to exceed 1/2 of the nominal joint width, or less if required by sealant manufacturer.
      c. Where a framing member runs continuously past a deflecting support, the support deflection is to be considered in the analysis.
   3. In the plane of the wall, deflection of framing members is not to exceed 0.125 inch. This includes horizontal rail sag due to dead load. Corner mullion in-plane deflection due to wind pressure is limited to 1/4 inch maximum at any time. Reduce deflection further if required for assembly and fit of component, or performance of sealant in joints.
   4. At connection points of framing members to anchors, combined movement of anchor relative to building structure, and framing member relative to anchor, is not to exceed 1/16 inch in any direction.
   5. The center deflection of the stool trim, when subjected to a 250 lb vertical concentrated load, is to be a maximum of 1/4 inch. No permanent set is allowed when load is removed.
   6. Stresses are not to exceed the allowable values established by the specifications listed in code standards. In no case are the allowable values to exceed the yield stress. Where permitted by code, a 1/3 increase in allowable stress for wind load is generally acceptable, but not in combination with any reduction applied to combined loads.
   7. Sealants and interior finishes are not to be assumed to contribute to framing member strength or stiffness.
   8. The deflection of metal panels, fascia or other sheet fabricated elements is not to exceed L/120 of the span or 3/4 inch whichever is less or at specified design pressure. Deflection is to be measured relative to the horizontal and vertical support members with the allowable deflection being determined by the lesser dimension.

9. At 1.5 times the design pressure loads for metal members supporting glass and panels, the net permanent deflection of framing members is not to exceed 1/1000 times span. There is to be no failure or gross permanent distortion of framing members, anchors or connections. At connection points of framing members to anchors, combined movement of anchor relative to building structure, and framing member relative to anchor, is not to exceed 1/16-inch set after load is removed.
10. Impact Loads:
    a. In addition to all other loads specified, design aluminum unitized window wall to resist impact loads on infill areas below 42 inches above finish floor.
    b. Design aluminum unitized window wall framing capable of resisting loads from a horizontal load of 200 pounds applied to any 1 square foot of infill area, at any point, in any direction on infill.
11. Guardrails: Design unitized window wall used as a guardrail and its anchors capable of withstanding a concentrated load of 200 pounds applied at any point in any direction along the top railing member, also a uniform load of 50 plf applied horizontally at the required guardrail height and a uniform load of 100 plf applied vertically downward at the top of the guardrail.
12. Wind Loads: Provide unitized window wall system and anchors used to secure the unitized window wall system to the building construction design and engineered to perform under the wind load pressures of 25 lbs/sf.

I. Anchors and Connections - General:
1. Anchors, connections and assemblies connecting the unitized window wall components and associated fabrications to the supporting construction are shown on the Drawings as suggested locations and details for the unitized window wall manufacturer/installer's information. The unitized window wall manufacturer/installer is responsible for the structural design of the connections and anchors, including all connecting hardware, accessories and reinforcing necessary for fabrication, assembly and installation of the unitized window wall system and associated fabrications.
2. The unitized window wall manufacturer is to notify the Architect in writing prior to the submittal of shop drawings of any changes in the proposed locations of connections and anchors.
3. The Architect's review of shop drawings is not to be construed as removing responsibility from the unitized window wall manufacturer/installer for structural failures related to design, fabrication, assembly, installation and fabrication service.

J. Cast-In-Place Concrete Inserts and Anchors: Headed concrete studs welded to steel elements and cast-in-place with structural concrete are to have a minimum safety factor of 2.0 against ultimate failure. Unistrut type or ferrule type concrete inserts are to have minimum safety factor of 3.0 against ultimate failure. All drilled expansion or wedge type anchors are to have a minimum safety factor of 4.0 against ultimate failure. Use of 1/3 increase for allowable stresses is not acceptable unless written approval by manufacturer is provided.

K. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
    a. Specified Design Wind Loads: 25 lbs/sf.
    b. Impact Loads: Per applicable code, herein referenced industry standard or herein specified requirement.
2. Glass Manufacturer's Engineering Analysis: The glass manufacturer is to perform wind load and thermal stress analysis and is to demonstrate compliance of glass with performance requirements.

1.3 QUALITY ASSURANCE

A. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the work.

B. Manufacturer Qualifications:
1. Provide products covered under this section produced by a single manufacturer unless otherwise specified.
2. The manufacturer is to submit evidence of having not less than 5 consecutive years of successful production.

C. Fabricator/Installer Qualifications: To avoid divided responsibility, engage a single firm to assume undivided responsibility for the complete installation of the unitized window wall system, including the aluminum framing, glass and glazing, and perimeter sealing.
   1. This firm is to demonstrate not less than 5 consecutive years successful experience in fabrication and installation of work similar to the work of this project.
   2. The work of this section is to be performed by a firm who is regularly engaged in the engineering, fabrication, finishing, installation, of similar work in connection with the unitized window wall.

D. Design Calculations:
   1. The unitized window wall fabricator is to submit design calculations to substantiate performance requirements specified herein, prepared by, signed and sealed by a professional engineer licensed in the State of Wisconsin.
   2. Calculations will not be reviewed by the Architect but are submitted for information purposes only.
   3. The responsibility for design and conformance with the performance requirements is that of the fabricator. Test reports are not an acceptable substitute for design calculations.
   4. The engineer for unitized window wall system is to be employed by the unitized window wall manufacturer.

E. Testing: Perform required tests through a recognized independent testing laboratory or agency and provide certified test report results in accordance with the requirements of Section 01 45 34, Quality Control for Exterior Wall Systems.

F. Reference Standards: Comply with the applicable portions of latest editions of the following standards. When conflicts arise between standards and this specification provide the more stringent.
   1. AAMA "Metal Curtain Wall Manual".
   2. AAMA "Aluminum Curtain Wall Design Guide Manual".
   3. AAMA, "Methods of Test for Exterior Walls," AAMA 501.
   4. AAMA/WDMA/CSA 101/I.S.2/A440: Voluntary Performance Specification for Windows, Skylights and Glass Doors.
   5. Aluminum Association "Specifications for Aluminum Structures".
   6. Structural Steel:
      a. “Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", including commentary of the AISC Specifications, AISC
      b. "Structural Welding Code", AWS D1.1.
   7. Glazing Material:
      a. FS DD-G-451D
      b. ANSI Z97.1
      c. ASTM C 1036
   8. Glass Coating: ASTM C1376 Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Glass
   9. Safety Glazing:
      a. ASTM C 1048
      b. ASTM C 1172
      c. ANSI Z97.1
      d. U.S. Consumer Product Safety Commission Standard 16 CFR 1201, Category II.
      e. GANA'S - Glazing Manual and Laminated Glass Design Guide.
   10. Insulating Glass:
      a. Manufacturing and Testing: ASTM E 2190.
      b. Installation: SIGMA TM-3000 Vertical Glazing Guidelines," and SIGMA TB-3001, "Sloped Glazing Guidelines."

G. Product Options: Information on the Drawings and in the Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated on the Drawings by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sight lines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria specified herein subject to verification as specified.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's written approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review prior to submittal of shop drawings.

1.4 SUBMITTALS

A. Submit the following in accordance with Section 01 33 23:

1. Product Data: System and material description and installation instructions for manufactured items and materials.
   a. Submit manufacturer's specifications to evidence compliance with these specifications.
   b. Submit manufacturer's installation instructions, including sealing of joints, and complete instructions for the handling, storage, cleaning, and protection of the aluminum framing members and the glazing materials.
   c. Submit statement that each product to be furnished is recommended for the application shown.
   d. Submit statement indicating method of ventilating "shadow boxes" and accepting engineering responsibility for design.
2. Shop Drawings:
   a. Plans, elevations and large scale details of the complete unitized window wall assembly, include a framing plan indicating frame members, size, gage and spacing.
   b. Indicate on Details: Metal materials, gages, finishes, methods of fabrication, welds, fasteners, fittings, accessories, supports, framing and anchors. Show all parts and components of system, support structure, adjacent construction and methods of attachment of canopy frame.
   c. Provide shop drawings with seal and signature of professional engineer licensed in the State of Wisconsin. Provide signature by the same engineer who prepares and signs the design calculations.
   d. Submit shop drawings and design calculations in a single submittal.
3. Mockup Shop Drawings for Visual and Testing Mockups: Prepare and submit complete mockup drawings and structural calculations with seal and signature of professional engineer licensed in the State of Wisconsin. Provide signature by the same engineer who prepares and signs the design calculations.
4. Thermal Modeling: Provide 10 Therm models, as selected by the Architect, of perimeter conditions to determine the average "U" value.
5. Design Calculations:
   a. Support Framing: Provide for design calculations to substantiate design and performance requirements specified.
   b. Glass:
      i. Provide design calculations showing conformance with the specified Performance Requirements prepared and certified by the glass manufacturer.
      ii. Wind Load and Thermal Stress Analysis: Three (3) copies of manufacturer's wind load and thermal stress analysis.
   c. Provide support framing and glass calculations prepared, sealed, and signed by a structural engineer licensed in the State of Wisconsin.
   d. Submit shop drawings and design calculations in a single submittal.
6. Samples:
   a. Three (3), 12-inch x 12-inch samples of each type of glass with specified edge treatment. All samples to include the coated glass color reference target (LAB).
   b. One (1) set of color samples of glazing sealant for each type of sealant used.
7. Test Reports: Three (3) copies of test reports certified by the unitized window wall manufacturer's testing laboratory. Show compliance with performance requirements. See 1.8, D below.
8. Warranties: Three (3) copies for the following:
   a. Unitized window wall system fabrication and installation.
   b. Insulating glass units.
   c. Glass coatings.
   d. Paint finish.
9. Sustainable Submittals:
   a. Regional Materials:
      i. Table summarizing all materials including:
         a) Item description.
         b) Place of manufacturing origin.
         c) Weight (or cost, if weight unavailable).
         d) Totals of the products sourced regionally versus outside of region along with percentages of total.
      ii. Contractor's Schedule of Values

b. Reused, Repurposed, or Recycled Materials:
   i. Documentation of total project(s) materials cost.
   ii. Table summarizing all materials used including:
      a) Percentage of material that is reused, recycled, or repurposed (or zero for virgin material)
      b) Total and percentages of virgin materials versus reused, recycled, repurposed materials.
   iii. Contractor or manufacturer certifications that demonstrate the materials were reused, recycled, repurposed and the percentage of this content.
c. No/Low-VOC Coatings, Paints, and Sealants:
   i. Table showing:
      a) Manufacturer and product name of all coatings, paints, and sealants applied to interior spaces within 2-years of the preliminary review submission.
      b) Areas where coatings, paints, and sealants have been applied and purpose of coatings, paints, and sealants.
      c) Application dates.
      d) Relevant standard under which the no/low-VOC product is listed.
   ii. Specification sheets verifying each coating, paint, and sealant as no- or low-VOC.
   iii. Policies and procedures regarding no- or low-VOC materials.

1.5 DELIVERY, HANDLING, AND STORAGE

A. Deliver, store and handle all unitized window wall system assemblies so as to prevent damages, as per manufacturer's recommendations. Deliver fabrications to the project site in as large of sections possible, clearly marked for proper identification. Provide fabrications wrapped to protect paint finish from damage during delivery, storage and handling.

B. Store fabrications in accordance with manufacturer's instructions, above ground, wrapped and protected from weather, construction activities and other causes of damage or loss. Deliver to project site at time to allow for immediate installation so as to prevent damage.

C. Exercise special care when handling, shipping and erecting factory-finished aluminum to avoid abrasion or any other damage to the finished surfaces. When stacking and storing the components in the shop, in transit and at the job site use softeners and timbers to keep individual members free from contact with the ground, and with each other. Protect components from soiling by adjacent fabrication or construction operations. Handle materials at the job site in such a manner as to prevent damage. All damaged or otherwise unsuitable material when so ascertained shall be immediately removed from the job site.

D. Deliver and handle structural steel fabrications in accordance with the applicable portions of AISC, Code of Standard Practice.

E. Remove delivered materials which are disfigured, cracked, chipped, or scratched, or otherwise not suitable for installation from the job site and replace with new materials at no cost to any other party.

1.6 WARRANTY

A. Unitized Window Wall System: Provide manufacturer/fabricator/installers written warranty stating that the complete structurally glazed unitized window wall system, including sealants, will be free of faults and defects in accordance with the General Conditions.
   1. Provide warranty in accordance with the General Conditions except the warranty period is to be for ten (10) years.
   2. Provide warranty signed by the Manufacturer and Fabricator/Installer.
   3. Faults and defects include but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection, water leakage, air infiltration, condensation and glass breakage.
      b. Noise or vibration caused by thermal movement.
      c. Adhesive or cohesive sealant failures.
      d. Failure of system to meet Performance Requirements.

B. Insulating Glass Units:
   1. Provide insulating glass unit manufacturer's written warranty for the insulating glass units to be free of visual obstruction due to internal moisture or dust collecting on the interior glass surfaces.

2. Provide warranty in accordance with the General Conditions except the warranty period is to be for ten (10) years.
3. Provide warranty signed by the Subcontractor and Insulating Glass Manufacturer.

C. Finish Warranty:
1. Provide Unitized Window Wall Manufacturer's written warranty stating that the paint finish used on all unitized window wall and entrance components is be free from chipping, peeling, cracking, fading or blistering in accordance with the General Conditions except the warranty period is to be for twenty (20) years.
2. Color fade not to exceed 5 E units (NBS) as calculated in accordance with ASTM D 2244 on exposed surfaces cleaned with clean water and a soft cloth.
3. Degree of chalking not to exceed rating No. 8 when measured in accordance with ASTM D 659 on exposed unwashed surfaces.
4. Provide warranty signed by the unitized window wall manufacturer and paint finish applicator (if separate from unitized window wall manufacturer).

D. Coated Glass:
1. Provide coated glass manufacturer's written warranty covering deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.
2. Provide warranty in accordance with the General Conditions except the warranty period is to be for ten (10) years.
3. Provide warranty signed by the Contractor and (Manufacturer/Fabricator/Installer).

E. The above warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

1.7 FACTORY TESTING

A. Distortion Tolerance Testing:
1. Measure each pane of monolithic heat-treated or coated glass of 6 mm thickness or more used in the Project, including glass used in visual mockups.
2. Measurement Device: Use a 3-point trolley, or equal, to measure the first 5 lites and then measure every hour to check flatness requirements for silk-screened glass, full coverage ceramic fritted glass, glass of greater than 3/8-inch thickness, or dark tinted 3/8-inch glass.
3. Roll Wave Criteria (horizontal): Maximum 0.003 Center / 0.008 Edges (Peak to Valley).
4. Millidiopter Criteria: (90 percent surface) Maximum + or – 125 A.
5. Documentation:
   a. Document and record results for each pane.
   b. Tag each pane of glass that falls outside of the maximum distortion limits and certify that these non-conforming glass panes will not be fabricated and supplied to the Project.
   c. Provide additional written documentation upon request by the Owner or Architect.
6. Bow/Warp Tolerance:
   a. Maximum 1/2 of ASTM C 1048 or 1/32 inch per lin ft, whichever is greater.
   b. Measure every hour on a vertical plane with a metal straight edge.
   c. Provide recorded written documentation upon request.

B. Preconstruction Insulating Glass Unit Requirements and Sealant and Desiccant Testing:
1. Test insulating glass units.
2. Butterfly Primary Seal Unit Adhesion Pull Testing:
   a. Adhesion Criteria: Comply with pass / fail requirements of manufacturer's published guidelines and/or manufacturer's certification audit requirements / recommendations. Minimum pull back to 30 degrees from horizontal with no significant adhesive failure.
   b. Test 1 unit each shift and after each carton change and/or project or product change.
   c. Minimum unit size 24 inches x 36 inches.
   d. Test units shall be fabricated on the same production line and processing equipment, and with the same spacers and sealant used in the production of the insulating glass units fabricated for the Project during the production of the project.
3. Desiccant Temperature Rise Testing:
   a. Test Criteria: Comply with desiccant manufacturer's written recommendations.
   b. Test a minimum of once every shift and after each drum change.

c. Perform Residual Moisture Test: Minimum temperature rise equal to or greater than 50 degrees Fahrenheit.

4. Bow/Warp and Air Space Measurement. Concave/Convex:
   a. Measure bow warp every hour on a vertical plane with a metal straight edge.
   b. Measure center air space every hour and all units equal to or more than 35 sq ft. Measure positive/negative air within the insulating glass unit controlled to plus or minus 1/16 inch at the time of fabrication utilizing a laser, or other device acceptable to the Architect, at a minimum frequency of every hour. Visually check each unit.
5. Skips and voids in the primary or secondary seals are prohibited and maximum gap at primary/secondary seal interface is 2 inch length and 1/16 inch in width. The PIB must be continuous with a targeted width of 5/32 inch and minimum width of 3/32 inch.
6. Documentation:
   a. Document and record results.
   b. Tag each Insulating Glass Unit that falls outside of the defined limits and certify that these non-conforming Insulating Glass Units will not be supplied to the Project.
   c. Provide additional written documentation upon request by the Owner or Architect.

C. Preconstruction Glass Color Testing:
1. Measure monolithic coated glass and coated insulting glass units.
2. Establish color target and perform quality color control checks using on-line or off-line spectrophotometer instrumentation (Minolta 2500d / 2600d or equal). Color measurement taken from uncoated side in the central area. The first 15 panes / units, then measure a minimum of 1 unit every hour and each product change.
3. Tolerances for color variation shall be less than 4.5 DE or as defined in ASTM C 1376.
4. Documentation: Document and record results. Tag each pane / unit of glass that falls outside of the maximum color variation limits and certify that nonconforming glass will not be fabricated and or supplied to the Project.

1.8 MOCKUP INSTALLATION

A. General:
1. Prior to the start of fabrication, prepare and submit complete mockup drawings and structural calculations stamped by a professional engineer licensed in the State of Wisconsin, for both visual and testing mockups.

B. Visual Mockup:
1. After the Architect approves the submittal, prepare a full-size pre-production visual mockup of a typical unitized window wall assembly as shown on the Drawings for the Architects review. The mockup installation may be at either the job site or the manufacturer's plant as mutually agreed. After review of the pre-production mockup, it will be retained and used as a standard of quality for production. When utilized in the building installation, record the location of the reviewed mockup on the Record Drawings. This mockup is separate and in addition to mockup for unitized window wall testing.
2. Include in the mockup; typical glazing materials, paint and metal finishes, corner details and other details and fabrications of the unitized window wall requiring prior review before the start of fabrication.
3. Construct mockups in accordance with approved mockup shop drawings. Any deviation from or additions to details shown on drawings are subject to approval by Architect.
4. The Architect's and Owner's review of the mockup installation will be for final acceptance of paint finish, quality of assembly and detail and conformance with design and general quality prior to production and does not relieve the Manufacturer/Fabricator from the responsibility and conformance with all herein specified requirements.

C. Testing Mockup:
1. Owner will engage a qualified testing agency to perform preconstruction testing on laboratory mockups.
2. This mock-p is separate and in addition to mockups for visual review.
3. Refer to Sections 01 45 34, Quality Control for Exterior Wall Systems for additional requirements.
4. Include in the mockup; typical glazing materials, paint and metal finishes, corner details and other details and fabrications of the unitized window wall requiring prior review before the start of fabrication.
5. Construct mockups in accordance with approved mockup shop drawings. Any deviation from or additions to details shown on drawings are subject to approval by Architect. Do not use excessive

amounts of sealant, nor other special measures or techniques, which are not representative of those to be used on the building.

6. Build laboratory mockups at testing agency facility using personnel, materials, and methods of construction that will be used at Project site.
7. Notify Architect seven days in advance of the dates and times when laboratory mockups will be constructed.

PART 2 – PRODUCTS

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

A. Reflection Window + Wall (formerly Elston Window + Wall):
   1. RWW-9500 Series.
B. Entekk Group, Ltd:
   1. 7000PAF Series with Talon Wall anchoring.
C. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 SUPPORT FRAMING MATERIALS

A. Structural Steel Shapes and Plates: ASTM A 36.
B. Steel Plates to be Bent or Cold Formed: ASTM A 203.
C. Bolts, Nuts & Washers:
   1. Structural Bolts: Conform to ASTM A 325, heavy hex, high tension type, quenched and tempered, medium carbon steel. Direct tension indicator washers may be used at the Fabricator's option.
   2. Nuts: Heavy hex, ASTM A 563, Grade DH.
   3. Washers: ASTM F 436, Type I.
D. Aluminum:
   1. Sheet and Plate: ASTM B 209.
   2. Bar and Rods: ASTM B 211.
   3. Extruded Bars, Roads and Shapes: ASTM B 221.
   4. Drawn Seamless Tube: ASTM B 210.
   5. Standard Structural Shapes, Rolled or Extruded: ASTM B 308.
E. Stainless Steel Sheet: ASTM A 666, Type 304, No. 4 finish, directional polish, minimum thickness 0.031 inch (22 Gauge), unless otherwise shown on the Drawings or required by each item of fabrication or as specified herein.
F. Stainless Steel Bars: ASTM A 276, Types 302, No. 4 finish, directional polish, size and thickness as required for each item of fabrication.
G. Welding Electrodes: AWS Specifications for each type of material being welded.
H. Metal to Metal Fasteners: Same basic metal or alloy as the metal fastened, and finished to match in color and texture. Comply with FS FF-S-92 for machine screws. Provide the type of fasteners shown on the Drawings or required by conditions of fabrication or installation. Provide Phillips flat-head screws for exposed fasteners, unless otherwise shown on the Drawings.
   1. Stainless-steel fasteners, 300 Series, in wet areas and exterior components. Provide Bi-Flex or Drill-Flex fasteners as manufactured by Elco Construction Products, or other as approved by Architect.
I. Support Steel Exposed to Weather - Shop Coat Paints:
   1. Primer Coat:
      a. Series 10-1009, Tnemec.
      b. GP-818, Carboline.
   2. Steel Intermediate Coat:
      a. Epoxy-Polyamide Coating, Series 66 Hi-Build Epoxoline, Tnemec.
      b. Carboguard 888, Carboline.
   3. Finish Coat: High-Build Acrylic Polyurethane Enamel:
      a. Series 73 Endura-Shield III Semi-Gloss, Tnemec (1074 Gloss & 1075 High Gloss).
      b. Carbothane 133 HB Semi-Gloss, Carboline.
      c. One standard color for all fabrications.

2.3 GLASS AND GLAZING

A. Sustainable Requirements:
   1. Include a minimum 15% pre-consumer recycled glass in the prime glass (before coating).
B. Glass Types: Refer to Drawings for glass types.
C. Clear Float Glass: Complying with ASTM C 1036, Type I, Class 1, Quality q3, thickness as shown or specified, tempered in doors and adjacent lights where shown on Drawings, required by codes or structural calculations, one of the following:
   1. PPG Industries.
   2. Oldcastle.
   3. Pilkington.
   4. Viracon.
   5. Interpane Glas Industrie AG.
   6. Or other as approved by the Architect.
D. Clear Low-Emissivity (Low E) Glass: Complying with ASTM C 1376 magnetic sputter vacuum coated low-emissivity glass, thickness as required to meet performance and installation requirements, tempered or heat strengthened where required, shown on Drawings or required by codes, one of the following:
   1. PPG Industries.
   2. Oldcastle.
   3. Pilkington.
   4. Viracon.
   5. Interpane Glas Industrie AG.
   6. Or other as approved by the Architect.
E. Spandrel Glass: Complying with ASTM C 1048, Condition B, Type 1, Quality q3, tempered in doors and adjacent lights where shown on Drawings or required by codes, with ceramic frit on one surface, heat strengthened where specified or required by the glass manufacturer for the conditions of the installation or to comply with specified performance requirements, color selection by Architect from non-standard colors with one (1) color being utilized for all installations.
   1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.
F. Insulating Glass Units:
   1. Provide units manufactured, tested and approved in accordance with SIGMA requirements. Provide units warranted for ten (10) years by the manufacturer against material obstruction of vision resulting from film restoration or dust collection between glass surfaces.
   2. Unless shown or noted otherwise on the Drawings, provide units consisting of minimum 1/4 inch glass (clear or clear with Low - E coating) outboard lite plus 1/2 inch air space plus minimum 1/4 inch clear float glass inboard lite. Provide tempered and/or heat strengthened units as required conditions of the installation and/or code requirements.
G. Silk Screened Glass
H. Sealants:
   1. Glazing Sealant (Joints between glass); One Part Silicone, FS TT-S-00230C, Type II, Class A:
      a. Silglaze, General Electric.
      b. 999, Dow Corning.
      c. Proglaze Silicone Construction Sealant, Tremco.
      d. 863, Pecora.
   2. Structural Silicone Sealant; One- or Two-Part Silicone, Non-Sag, FS TT-S-001543A, Type II, Class A, one of the following:
      a. SSG 4000 and SSG 4200, General Electric.
      b. 795 and 983, Dow Corning.
   3. Sustainable Requirements: Provide adhesives and sealants used inside the weatherproofing system meet the testing and product requirements of the South Coast Air Quality Management District Rules #1113 and #1168.
I. Setting Blocks: Manufacturer's standard silicone blocks.
J. Perimeter Sealants: Refer to Section 07 92 00, Sealants.

2.4 FABRICATION – SUPPORT FRAMING

A. Fabricate structural steel support framing in accordance with the AISC, Code of Standard Practice.

B. Fabricate and assemble all items in the shop and mark each item to ensure proper installation at the project site. Disassemble for shipment only to the extent required by shipping limitations.
C. Carefully match parts of the fabrication to maintain continuity of line and design. Join all parts with hairline contact, flush and smooth with adjacent surfaces, using concealed welds and fasteners where possible.
D. Provide finished fabrications which do not exhibit pitting, seam marks, roller marks, oil-canning, stains, grinder marks, trade or manufacturer marks, logos or lettering, discolorations or other imperfections on the finished units. Remove all mill and manufacturer designations, trademarks and other surface markings, fill, grid and blend surfaces smooth to match adjoining surface. Remove all surface grinder marks and imperfections that would adversely affect the finish appearance of the fabrication.
E. Provide connections, brackets, plates and straps with each fabricated assembly, as may be required for proper support and anchorage to the construction and for other work.
F. Cut, reinforce, drill and tap fabricated metal work as may be required to receive other items of work.
G. Shop Paint Preparation:
    1. Complete the fabrication and assembly of units prior to the application of coatings, so that uncoated edges will not be exposed.
    2. Grind sharp edges made by flame cutting and shearing to produce a flattened edge prior to shop painting.
    3. Remove weld spatter.

2.5 HEAT-TREATED, TEMPERED, AND HEAT-STRENGTHENED GLASS

A. Provide tempered and heat strengthened glass horizontally heat-treated in accordance with FS DD-G-1430B. Fabricate tempered and heat strengthened glass units so that roll distortion lines are parallel to the bottom edge of the glass units and the bottom or sill of the glazing pocket into which the glass unit is being installed.
B. Provide heat treated glass complying with ASTM C 1048 for the following.
    1. Kind HS: Heat strengthened.
    2. Kind FT: Fully tempered.

2.6 FABRICATION – GLASS PANELS

A. Fabricate and assemble all items in the shop and mark each item to ensure proper installation at the project site.
B. Edge Treatment: Flat-grind and polish exposed edges of glass fabrications in a manner that produces square edges with a slight ease at corners on both sides of lite.
C. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
    1. Measurement Device: LiteSentry measurement system, or equal.
    2. Roll Wave Criteria (horizontal): Maximum 0.003 Center / 0.008 Edges (Peak to Valley).
    3. Millidiopter Criteria: (90 percent surface) Maximum + or – 125 A overall.

2.7 METAL FINISHES

A. Exterior Finish: Provide the following on all exposed exterior metal:
    1. Provide all exposed unitized window wall members free of scratches and blemishes affecting the finish system.
    2. Factory finish all exposed unitized window wall members, accessories, trim, closures and hardware items so specified with fluoropolymer resin-base 2-coat system containing 70 percent "Kynar 500" resin. Provide paint finish system consisting of the following:
        a. Processed and clean aluminum in accordance with ASTM B 449, Section 5.
        b. Apply pretreatment conversion coating in accordance with ASTM D 1730, Type B, Method 5 or 7 with pretreatment conversion coating weighing not less than 30 mg per sq ft.
        c. Prime aluminum with thermo-cured inhibitive primer averaging not less than 0.2 to 0.3 mil dry film thickness.
        d. Color coat applied to a minimum thickness of 1.0 mil dry film thickness.
    3. Factory apply all of the above and cure in accordance with the current published specifications of the paint formulator and manufacturer.

4. Factory apply the finish paint system in accordance with the manufacture's printed requirements and performance specifications and the AAMA specification 2605 for Superior Performance Organic Coatings on Aluminum Extrusions and Panels.
5. Color Selection: Match PPG Duranar Sunstorm Pewter.

B. Interior Finish: Provide exposed interior aluminum with a spray applied thermoset modified polyester high solid coating similar to PPG Polycron III or other as approved by the Architect. Provide coating meeting the performance requirements of AAMA 2603. Color selection by Architect from standard colors for the unitized window wall members, trim and accessories.

C. Concealed Members: May be mill finish, providing they cannot be seen through the glass.

D. Structural Silicone Glazing: Provide aluminum surfaces which are to serve as a bonding surface for structural silicone with an alodine finish.

E. It is the intention of the specification that the color variation between adjacent parts of the same finish be imperceptible to the naked eye under normal daylight conditions. Pieces abutting or within 6 inches of each other in the construction are not to vary in color by more than 1/2 the range so as the variation to be imperceptible to the naked eye under normal daylight conditions. Inspect parts in the shop and grade for assembly compatibility and mark for installation location.

F. Quality Control: Establish and submit for review a quality control program to assure compliance with the specified requirements. Include in the program documented procedures, processes, and other means for quality control. Maintain complete inspection, testing and process records of finishing procedures. Make records available to the Architect upon request. No finishing is to be performed prior to approval of this quality control program.

G. Do not ship any material that has not been inspected, tested and marked as specified, or does not fall within the prescribed color range.

H. Provide protection against galvanic action wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc or relatively small areas of stainless steel. Provide protection by painting the dissimilar metal surfaces with a heavy coat of ZRC Zinc primer or by application of an appropriate sealant or tape or other galvanic isolator.

I. Protect aluminum which is to be in contact with cured concrete, mortar or plaster. Apply a heavy coat of bituminous paint applied to the aluminum, or other permanent separator on concealed contact surfaces of the aluminum before assembly or installation.

J. Clean items of carbon steel, unless galvanized or scheduled for other finish or otherwise specified, of loose scale, filings, dirt and other foreign matter and paint with zinc rich primer, complying with paint Specification No. 20 of the Steel Structures Painting Council (SSPC). Prepare surface meeting the minimum requirements of SSPC-SP6.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine all surfaces and conditions of the installation prior to fabrication and installation. If unsatisfactory conditions exist, notify the General Contractor in writing, who will be responsible for making such corrections.

B. Installation of the support framing, point support glass fittings, glass panels, and associated fabrications constitutes acceptance of the conditions present at the site.

3.2 UNIT FABRICATION

A. Install glass panels in accordance with the final reviewed shop drawings and the manufacturer’s printed installation instructions.

B. Remove protective coatings that might fail in adhesion or interfere with the bonding of materials of deleterious substances that might impair the work. Remove protective coatings that might fail in adhesion or interfere with bond of sealants. Comply with the manufacturer’s instructions for final wiping of surfaces immediately before the application of primer and glazing sealants. Wipe metal surfaces with an appropriate cleaning agent.

C. Inspect each unit of glass immediately before installation. Do not install units with damage at edges, scratches, abrasion of faces or any other evidence of damage.

D. Sealants: Prime surfaces to receive glazing sealants where required, in accordance with the sealant manufacturer's recommendations, using recommended primers.
E. Locate setting blocks, if required by conditions of the installation at the quarter points of the sill, but no closer than 6 inches to corners of the glass. Use blocks of proper sizes to support the glass in accordance with the manufacturer's recommendations.
F. Set the glass in a manner that produces the greatest possible degree of uniformity in appearance. Face all glass, which has a dissimilar face with matching faces in the same direction.
G. Use masking tape or other suitable protection to limit the coverage of glazing materials on the surfaces intended for sealants.
H. Tool the exposed surfaces of glazing materials.
I. Clean excess sealant from the glass and support members immediately after the application, using solvents or cleaners recommended by the manufacturers.
J. Cure sealants in accordance with the manufacturer's instructions to attain maximum durability and adhesion to glass.

3.3 UNIT INSTALLATION

A. Provide unitized window wall system designed to accommodate the tolerances of the surrounding conditions and the building frame. Do not exceed the tolerances and clearances shown on the final reviewed shop drawings. Maintain parts of the unitized window wall, when completed, within the following tolerances.
   1. Maximum offset from true alignment between any two identical members abutting end to end in line to be 1/32 inch.
   2. Maximum variation from plane or location shown on the final reviewed shop drawings, not greater than 1/8 inch per 12 ft length or 1/2 inch in any total length.
B. Bolt Torque: Torque bolts to torques specified on shop drawings using a calibrated tool. Lock torque bolts into position to prevent back-off. Reset calibrations regularly to ensure an accurate torque.
C. Install support framing and anchors in accordance with the final reviewed shop drawings.
D. Set framing and anchors accurately as measured from established building lines and levels, plumb and in true alignment with previously completed new work. Allow for expansion and contraction of materials and building construction.
E. Anchor securely in place in the manner shown on the final reviewed shop drawings, using specified anchors.
F. Attach supports and anchor to the building structure utilizing welded or bolted connections.

3.4 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to glass.
B. Remove and replace glass which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism and accidents during the construction period at no additional cost to the Owner.
C. Maintain glass in a reasonably clean condition during construction so that it will not become stained and will not contribute to the deterioration of glazing materials. Remove mortar and concrete splatter immediately.
D. Wash and polish glass on both faces just prior to final acceptance. Comply with instructions and recommendations of the glass manufacturer and glazing materials manufacturer for cleaning in each case.

3.5 TOUCH-UP OF PAINTED SURFACES

A. After the installation, touch up all weld, bolt or screw connections and surfaces where shop paint has been abraded or improperly applied with the same paint materials specified for shop finishing in the same number coats as specified for shop painting.
B. Submit materials and methods of surface repair and repainting to the Architect for reviewed prior to application.

3.6 TESTING OF UNITIZED WINDOW WALL SYSTEM

A. Testing Agency: The Owner will engage a qualified independent testing and inspecting agency to perform and witness field tests and inspections and to prepare test reports.

B. Refer to Section 01 45 34, Quality Control for Exterior Wall Systems, for requirements of quality control testing.
C. Repair leaks and other defects and retest as directed by the Architect. Repair or replace other work damaged by such leaks at no additional cost to the Owner.

END OF SECTION

SECTION 08 71 00.00
DOOR HARDWARE

PART 1 – GENERAL

1.1 CONDITIONS

A. Conditions of the contract (General and Supplementary Conditions) and Division One General Requirements, govern the work of this section.

B. This section includes all material, and related service necessary to furnish all finish hardware indicated on the drawings, or specified herein.

C. Furnish UL listed hardware for all labeled and 20 min. openings in conformance with the requirements for the class of opening scheduled. Underwriters' requirements shall have precedence over specification where conflicts exist.

D. All work shall be in accordance with all applicable state and local building codes. Code requirements shall have precedence over this specification where conflicts exist.

1.2 WORK INCLUDED

A. This section includes the following:
   1. Furnish door hardware (for hollow metal, wood and aluminum doors) specified herein, listed in the hardware schedule, and/or required by the drawings.
   2. Cylinders for Aluminum Doors
   3. Thresholds and Weather-stripping (Aluminum frame seals to be provided by aluminum door supplier)
   4. Electro-Mechanical Devices
   5. Access Control components and or systems specified within this section.

B. Where items of hardware are not definitely or correctly specified and is required for the intended service, such omission, error or other discrepancy should be directed to the Architect prior to the bid date for clarification by addendum. Otherwise furnish such items in the type and quantity established by this specification for the appropriate service intended.

1.3 RELATED WORK IN OTHER SECTIONS

A. This section includes coordination with related work in the following sections:
   1. Division 6 Section "Finish Carpentry".
   2. Division 6 Section "Cabinet Hardware"
   3. Division 8 Section "Hollow Metal Doors and Frames".
   4. Division 8 Section "Wood Doors"
   5. Division 8 Section "Aluminum Entrances and Storefronts"
   6. Division 28 Sections "Electrical".

1.4 REFERENCES

A. Publications of agencies and organizations listed below form a part of this specification section to the extent referenced.
   1. DHI - Recommended Locations for Builders' Hardware.
   2. NFPA 80 - Standards for Fire Doors and Windows.
   3. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
   4. UL - Building Material Directory.
   5. DHI - Door and Hardware Institute
   6. WHI - Warnock Hersey
   7. BHMA - Builders Hardware Manufacturers Association
   8. ANSI – American National Standards Institute
   9. IBC 2009 - International Building Code 2009 Edition (as amended by local building code)

1.5 SUBMITTALS

A. Within ten days after award of contract, submit detailed hardware schedule in quantities as required by Division 1 - General Conditions.

B. Schedule format shall be consistent with recommendations for a vertical format as set forth in the Door & Hardware Institute's (DHI) publication "Sequence and Format for the Hardware Schedule". Hardware sets shall be consolidated to group multiple door openings which share similar hardware requirements. Schedule shall include the following information:
   1. Door number, location, size, handing, and rating.
   2. Door and frame material, handing.
   3. Degree of swing.
   4. Manufacturer
   5. Product name and catalog number
   6. Function, type and style
   7. Size and finish of each item
   8. Mounting heights
   9. Explanation of abbreviations, symbols, etc.
   10. Numerical door index, indicating the hardware set/ group number for each door.

C. When universal type door closers are to be provided, the schedule shall indicate the application 1 method to be used for installation at each door: (regular arm, parallel arm, or top jamb).

D. The schedule will be prepared under the direct supervision of a certified Architectural Hardware Consultant (AHC) employed by the hardware distributor. The hardware schedule shall be signed and embossed with the DHI certification seal of the supervising AHC. The supervising AHC shall attend any meetings related to the project when requested by the architect.
E. Hardware supplier shall field verify with the Owner all existing doors and frames to remain (including those to be relocated) for existing hardware suitability to remain I.L.O. specified hardware prior to ordering new hardware, and check the specified hardware for suitability and adaptability to the details and surrounding conditions.
F. Review drawings from related trades as required to verify compatibility with specified hardware. Indicate unsuitable or in compatible items, and proposed substitutions in the hardware schedule.
G. Provide documentation for all hardware to be furnished on labeled fire doors indicating compliance with positive pressure fire testing UL 10C.
H. Furnish manufacturers' catalog data for each item of hardware in quantities as required by Division 1 - General Conditions.
I. Submit a sample of each type of hardware requested by the architect. Samples shall be of the same finish, style, and function as specified herein. Tag each sample with its permanent location so that it may be used in the final work.
J. Furnish with first submittal, a list of required lead times for all hardware items.
K. After final approved schedule is returned, transmit corrected copies for distribution and field use in quantities as required by Division 1 - General Conditions.
L. Furnish approved hardware schedules, template lists, and pertinent templates as requested by related trades.
M. Furnish necessary diagrams, schematics, voltage and amperage requirements for all electro-mechanical devices or systems as required by related trades. Wiring diagrams shall be opening specific and include both a riser diagram and point to point diagram showing all wiring terminations.
N. After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the owner's representative to determine keying requirements. Upon completion of the initial key meeting, hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the door and hardware institute's publication "Keying Procedures, Systems, and Nomenclature". Submit copies of owner approved key schedule for review and field use in quantities as required by Division 1 – General Conditions. Wiring diagrams shall be included in final submittals transmitted for distribution and field use.

1.6 QUALITY ASSURANCE

A. Manufacturers and model numbers listed are to establish a standard of function and quality. Similar items by approved manufacturers that are equal in design, function, and quality, may be considered for prior approval of the architect, provided the required data and physical samples are submitted for approval as set forth in Division One General Requirements.
B. Where indicated in this specification, products shall be independently certified by ANSI for compliance with relevant ANSI/BHMA standards A156.1 - A156.36 – Standards for Hardware and Specialties. All products shall meet or exceed certification requirements for the respective grade indicated within this specification. Supplier shall provide evidence of certification when requested by the architect.
C. Obtain each type of hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
D. Electrical drawings and electrical specifications are based on the specific electrified 1 hardware components specified in hardware sets. When electronic hardware components other than those indicated in hardware sets are provided, the supplier shall be responsible for all costs incurred by the design team and their consultants to review, and revise electrical drawings and electrical specifications. Supplier shall also be responsible for any additional costs associated with required changes in related equipment, materials, installation, or final hook up to insure the system will operate and function as indicated in the construction documents, including hardware set operational / functional descriptions.
E. All hardware items shall be manufactured no earlier than 6 months prior to delivery to site.
F. Hardware supplier shall be factory trained and certified by the manufacture to provide and support all computer managed locks and system components.
G. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 13 years' experience in successful completion of projects similar in size and scope.

H. Provide hardware for all labeled fire doors, which complies with positive pressure fire testing UL 10C.
I. Comply with all applicable provisions of the standards referenced within section 1.4 of this specification.
J. Hardware supplier shall participate when reasonably requested to meet with the contractor and or architect to inspect any claim for incorrect or non-functioning materials; following such inspection, the hardware supplier shall provide a written statement documenting the cause and proposed remedy of any unresolved items.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Hardware supplier shall deliver hardware to the job site unless otherwise specified.
B. All hardware shall be delivered in manufacturers' original cartons and shall be clearly marked with set and door number.
C. Coordinate with contractor prior to hardware delivery and recommend secure storage and protection against loss and damage at job site.
D. Contractor shall receive all hardware and provide secure and proper protection of all hardware items to avoid delays caused by lost or damaged hardware. Contractor shall report shortages to the Architect and hardware supplier immediately after receipt of material at the job site.
E. Coordinate with related trades under the direction of the contractor for delivery of hardware items necessary for factory installation.

1.8 PRE-INSTALLATION MEETING

A. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
B. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Manufacturers representatives for above hardware items, and any other effected subcontractors or suppliers.
C. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

1.9 WARRANTY

A. All hardware items shall be warranted against defects in material and workmanship as set forth in Division One General Requirements.
B. Repair, replace, or otherwise correct deficient materials and workmanship without additional cost to owner.

PART 2 – PRODUCTS

2.1 FASTENERS

A. All exposed fasteners shall be Phillips head or as otherwise specified, and shall match the finish of the adjacent hardware. All fasteners ex-posed to the weather shall be non-ferrous or stainless steel. Furnish correct fasteners to accommodate surrounding conditions.
B. Coordinate required reinforcements for doors and frames. Seek approval of the architect prior to furnishing through-bolts. Furnish through-bolts as required for materials not readily reinforced.

2.2 BUTT HINGES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Ives	Stanley	Hager	McKinney
1. Standard Weight, Plain Bearing	5PB1	F179	1279	T2714
2. Standard Weight, Ball Bearing	5BB1	BB179	BB1279	TB2714
3. Standard Weight, Ball Bearing, Non-Ferrous	5BB1	FBB191	BB1191	TB2314
4. Heavy Weight, Ball Bearing	5BB1HW	FBB168	BB1168	T4B3786
5. Heavy Weight, Ball Bearing, Non-Ferrous	5BB1HW	FBB199	BB1199	T4B3386

B. Hinges shall be independently certified by ANSI for compliance with ANSI A156.1 (2006). Hinges shall meet or exceed the following ANSI grade requirements as indicated below:
   1. Standard Weight, Plain Bearing Hinges: Grade 3
   2. Standard Weight, 2 Ball Bearing Hinges: Grade 2
   3. Heavy Weight, 4 Ball Bearing Hinges: Grade 1

C. Unless otherwise specified, furnish the following hinge quantities for each door leaf.
   1. 3 hinges for doors up to 90 inches.
   2. 1 additional hinge for every 30-inch on doors over 90 inches.
   3. 4 hinges for Dutch door applications.

D. Unless otherwise specified, top and bottom hinges shall be located as specified in division 8 Section "Hollow Metal Doors and Frames". Intermediate hinges shall be located equidistant from others.

E. Unless otherwise specified, furnish hinge weight and type as follows:
   1. Standard weight: plain bearing hinge 5PB1 for interior openings through 36 inches wide without a door closer.
   2. Standard weight: ball bearing hinge 5BB1 for interior opening over 36 through 40 inches wide without a door closer, and for interior openings through 40 inches wide with a door closer.
   3. Heavyweight: 4 ball bearing hinge 5BB1HW for interior openings over 40 inches wide, and for all vestibule doors.
   4. Heavyweight: 4 ball bearing hinge 5BB1HWss for exterior openings unless otherwise listed in groups.

F. Unless otherwise specified, furnish hinges for exterior doors, fabricated from brass, bronze, or stainless steel. Unless otherwise specified, hinges for interior doors may be fabricated from steel.

G. Unless otherwise specified, furnish hinges in the following sizes:
   1. 5" x 5" 2-1/4" thick doors
   2. 4-1/2" x 4-1/2" 1-3/4" thick doors
   3. 3-1/2" x 3-1/2" 1-3/8" thick doors

H. Furnish hinges with sufficient width to accommodate trim and allow for 180-degree swing.

I. Unless otherwise specified, furnish hinges with flat button tips with non-rising pins at 1 interior doors, non-removable loose pins (NRP) at exterior and out-swinging interior doors.

J. Unless otherwise specified, furnish all hinges to template standards.

2.3 CONTINUOUS GEARED HINGES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Ives	Hager	Stanley
1. Full Mortise:	112HD	780-112HD	661HD

B. Hinges shall be independently certified by ANSI for compliance with ANSI A156.26, Grade 1 (2012).

C. Continuous hinges shall be geared type hinge providing full height door support up to 600 lbs.

D. Hinge shall be non-handed with symmetrical template hole pattern and factory drilled.

E. Hinge to be able to carry Warnock Hersey Int. or UL for fire rated doors and frames up to 90 minutes.

F. Provide machine screws for doors which have been reinforced to accept machine screws.

G. Note: Fire label for doors and frames should be placed on the header and top rail of fire rated doors and frames.

2.4 POWER TRANSFERS

A. Acceptable manufacturers and respective catalog numbers:

Item:	Von Duprin
1. Concealed Two Wire	EPT-2
2. Concealed Ten Wire	EPT-10
3. Armored Door Cord Four Wire	788C-12
4. Armored Door Cord Four Wire	788C-18

B. Door cords shall be armored cable with screw on caps.

C. Concealed power transfers shall be concealed in the door and frame when the door is closed.

D. Concealed power transfers shall have a steel tube to protect wires from being cut.

E. Concealed power transfers with spring tubes shall be rejected.

F. Concealed power transfers shall be supplied with a mud box to house all terminations.

2.5 FLUSH BOLTS AND DUST-PROOF STRIKES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Ives	Door Controls	Hager
1. Dust Proof Strike	DP2	80	280X
2. Auto Flush Bolt (Metal Door)	FB31P	842	292D
3. Auto Flush Bolt (Wood Door)	FB41P	942	291D
4. Manual Flush Bolt	FB458	780	282D

B. Unless otherwise specified, provide 12" rods for manual flush bolts for door 7'-6" or less, 24" top rods for doors over 7'-6" to 8'-6".

C. Unless otherwise specified, provide doors over 8'6" with automatic 1 top bolts.

D. Provide automatic flush bolts where required to maintain fire door listing and or egress requirements on pairs of doors.

E. All flush-bolt applications shall be UL listed to be installed with top flush-bolt only. Provide auxiliary fire bolt as required for fire rated openings where less bottom bolt has been specified.

F. Provide all bottom flush bolts with non-locking dust proof strikes.

2.6 EXIT DEVICES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Von Duprin (No Substitution)
1. Wide Stile, Push Pad	98 / 99 Series
2. Wide Stile, Electric Latch Retraction (motor driven)	QEL 98 / 99 Series
3. Lever Trim	996 Series
4. Pull Trim	990 Series
5. Pull Trim	550 Series

B. Exit devices shall be independently certified by ANSI for compliance with ANSI A156.3, Grade 1 (2008).

C. Obtain exit devices from a single manufacturer, although several may be indicated as offering products complying with requirements.

D. All exit devices shall be equipped with a sound-dampening feature to reduce touch pad return noise.

E. Quiet Electric Latch Retraction shall be accomplished using a motor driven assembly, and shall incorporate the following features:
   1. Motor shall retract both the push pad assembly and latch bolt.
   2. Automatic calibration of latch throw and pull.
   3. Built-in time delay.
   4. On-board installation and troubleshooting diagnostics built into power supply and device.
   5. Retry mode if device does not pull on the first try.

F. On full glass doors there shall be no exposed fasteners on the back of the mechanism visible through the glass.

G. All exit devices shall be provided with flush end caps to reduce potential damage from impact.

H. All exit devices shall be provided with dead-locking latch bolts to insure security.

I. All exit devices shall be U.L. listed for accident hazard. Exit device for use on fire doors shall also be U.L. listed for fire exit hardware.

J. Provide optional strikes, special length rods, and adapter plates to accommodate door and frame conditions. Provide narrow style series devices in lieu of wide stile series devices where optional strikes will not accommodate door and frame conditions.

K. Coordinate with related trades to insure adequate clearance and reinforcement is provided in doors and frames. Provide thru bolts as required.

L. Refer to hardware groups for exit device applications utilizing the option of: "less bottom 1 rod and floor strike" (LBR)

M. All exit devices shall be provided with optional trim designs to match other lever and pull designs used on the project.

N. Unless specific exit device dogging options are noted within hardware sets, provide dogging options as follows:
   1. Fire Rated devices: Dogging not permitted.
   2. Non-Rated Exit Only functions not equipped with outside trim or pull: Less Dogging.
   3. Non-Rated Classroom functions: Less Dogging.
   4. Non-Rated devices utilizing electric latch retraction or electrified outside trim: Less Dogging.

O. All Other Non-Rated devices: Cylinder Dogging utilizing interchangeable core cylinders. Cylinder keyway shall match locksets furnished on this project.
P. Provide glass bead kits as required to accommodate door conditions. Screws shall not be visible through full glass doors.
Q. Where specified, provide compatible keyed mullions with cylinder for pairs of doors.
R. Provide reinforced crossbars for all traditional style exit devices applied to doors over 36" wide.

2.7 LOCKS AND LATCHES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Schlage (No Substitution)
1. Grade 1 Mortise	L Series Latitude x N Escutcheon

B. Bored locks shall be independently certified by ANSI for compliance with ANSI A156.2 (2011). Interconnected locks shall be independently certified by ANSI for compliance with ANSI A156.12 (2013). Mortise locks shall be independently certified by ANSI for compliance with ANSI A156.13 (2012).
C. Minimize transmission of heat to lock trim. Provide temperature control modules (TCM) on all electrified locks when cataloged by the lock manufacturer.
D. Unless otherwise specified, all locks and latches to have:
1. 2-3/4" Backset
2. 1/2" minimum throw latch bolt
3. 1" throw deadbolt
4. 6 pin cylinders
5. ANSI A115.2 strikes
E. Provide guarded latch bolts for all locksets, and latch bolts with sufficient throw to maintain fire rating of both single and paired door assemblies.
F. Length of strike lip shall be sufficient to clear surrounding trim.
G. Provide wrought boxes for strikes at inactive doors, wood frames, and metal frames without integral mortar covers.

2.8 PULLS, PUSH BARS, PUSH/PULL PLATES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Burns	Hager	Ives
1. Straight Pull (1" dia., 10" ctc)	26C	4J	8103-0
2. Straight Pull (3/4” dia., 8” ctc)	25B	3G	8102-8
3. Offset Door Pull (1" dia., 10" ctc)	39C	12J	8190-0
4. Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 26C	153	9103-0
5. Offset Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 39C	159	9190-0
6. Push Plate (.050 4"X 16")	54	30S 4 x 16	8200 4 x 16
7. Push Plate (.050 6"X 16")	56	30S 6 x 16	8200 6" X 16"
8. Pull Plate (1" dia., 10" ctc - .050" X 4" X 16")	5426C	34J 4 x 16	8303-0 4" X 16"

B. Adjust dimensions of push plates to accommodate stile and rail dimensions, lite and louver cutouts, and adjacent hardware. Where required by adjacent hardware, push plates shall be factory drilled for cylinders or other mortised hardware. All push plates shall be beveled 4 sides and counter sunk.
C. Where possible, provide back-to-back, and concealed mounting for pulls and push bars. Push bar length shall be 3" less door width, or center of stile to center of stile for stile & rail or full glass doors.

2.9 COORDINATORS

A. Acceptable manufacturers and respective catalog numbers:

Item:	Ives	Door Controls	Hager
1. Bar Coordinator	COR x FL	600 x Filler	297D x 297F
2. Mounting Bracket	MB Series	AB, C Series	297 Series

B. Provide coordinators at all pairs of doors having automatic flush bolts and closers on the inactive leaf, and for pairs of doors having vertical rod/mortise exit device combinations with overlapping astragals.
C. Provide appropriate filler bars, closer mounting brackets, carry bars, and special top latch preparations as required by adjacent hardware.

2.10 CLOSERS

A. Acceptable manufacturers and respective catalog numbers:

Item:	LCN	Sargent
1. Closer	4011 /4111 EDA	281 / 281P10 (less PRV valve)

B. Door closers shall be independently certified by ANSI for compliance with ANSI A156.4, Grade 1 (2013).

C. Obtain door closers from a single manufacturer, although several may be indicated as offering products complying with requirements.

D. Provide extra heavy-duty arm (EDA / HD) when closer is to be installed using parallel arm mounting.

E. Hardware supplier shall coordinate with related trades to insure aluminum frame profiles will accommodate specified door closers.

F. Provide “SPECIAL TEMPLATE - #1728 / #0723” closer arms as required to accommodate aluminum frame head details with “non-structural stops” when closers will be required to utilize parallel arm mounting positions. Frame mounting shoe shall be shortened, and pivot hub height shall be increased to permit frame mounted shoe to be positioned on frame rabbit (rather than the frame stop), and behind the frame stop rather than on top of the frame stop. Contact LCN Door Closers at: 877-671-7011 1 for pricing and design assistance.

G. Closers shall use high strength cast iron cylinders, forged main arms, and 1-piece forged steel pistons.

H. Closers shall utilize a stable fluid withstanding temperature range of +120deg F to -30deg F without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with standards UL10C.

I. Unless otherwise specified, all door closers shall have full covers and separate adjusting valves for sweeps, latch, and backcheck.

J. Provide closers for all labeled doors. Provide closer series and type consistent with other closers for similar doors specified elsewhere on the project.

K. Provide closers with adjustable spring power. Size closers to insure exterior and fire rated doors will consistently close and latch doors under existing conditions. Size all other door closers to allow for reduced opening force not to exceed 5 lbs.

L. Install closers on the room side of corridor doors, stair side of stairways and interior side of exterior doors.

M. Closers shall be furnished complete with all mounting brackets and cover plates as required by door and frame conditions, and by adjacent hardware.

N. Door closers shall be provided with a powder coat finish to provide superior protection against the effects of weathering. Powder coat finish shall successfully pass a 100-hour salt spray test.

O. Pressure Relief Valve, PRV, shall not be acceptable.

2.11 LOW ENERTY ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Acceptable manufacturers and respective catalog numbers:

Item:	LCN (No Substitution)
1. Electro-Hydraulic Operator	4640

B. Low energy operators shall be independently certified by ANSI for compliance with ANSI A156.19 (2002).

C. Where low kinetic energy, as defined by ANSI/BHMA Standard A156.19, power operators are indicated for doors required to be accessible to the disabled, provide electrically powered operators complying with the ADA for opening force and time to close standards.

D. The closing action shall be controlled by modern type cast iron door closer cylinder filled with a flat viscosity fluid, stable from +120F to -30F that would require no seasonal adjustments. The closer shall have field adjustable spring power; have two independent closing speed adjustment valves, and hydraulic back check.

E. Full closing force shall be provided when the power or assist cycle ends.

F. All power operator systems shall include the following features and functions:

1. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical Code, section 725-31.
2. The operator will be designed with an electronically controlled mechanical clutching mechanism to prevent damage to the operator if the system is actuated while the door is latched or if the door is forced closed during the opening cycle.
3. All covers, mounting plates and arm systems shall be powder coated and successfully 1 pass a minimum of 100 hours testing as outlined in ANSI/BHMA Standard A156.18.
4. UL listed for use on labeled doors.

5. All operators shall be non-handed with spring power over a range of at least four sizes; either 1 through 4 or 2 through 5.
6. The power operator shall incorporate microprocessor controlled digital controls including: factory default memory settings, on-board diagnostics, non-volatile memory, and integrated delay and relay for controlling door release devices.
7. Provisions in the control box or module shall provide control {inputs and outputs) for; electric strike delay, auxiliary contacts, sequential operation, fire alarms systems, actuators, swing side sensors, and stop side sensors.
8. Wall mounted actuators shall consist of a 4-1/2 inch diameter stainless steel touch plate with a blue filled handicapped symbol. Switches shall be weather resistant and mount on a single gang electrical box furnished by Division 16.

G. All electrically powered operators shall include the following features or functions:
1. When an obstruction or resistance to the opening swing is encountered, the operator will pause at that point, then attempt to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.
2. Easily accessible main power and maintain hold open switches will be provided on the operator.
3. An electronically controlled clutch to provide adjustable opening force.
4. A microprocessor to control all motor and clutch functions.
5. An on-board power supply capable of delivering both 12V and 24V outputs up to a maximum of 1.0 ampere combined load.
6. All input and output power wiring shall be protected by slow blow fuses. These fuses shall be easily replaceable without special tools or component replacement.
7. If electrical failure occurs, the unit shall operate as a standard door closer.

H. Power Operators shall be warranted by the manufacturer to be free from defects in material and workmanship for a period of two years.

2.12 KICK PLATES AND MOP PLATES

A. Furnish protective plates as specified in hardware groups.
B. Where specified, provide 10" kick plates, 34" armor plates, and 4" mop plates. Unless otherwise specified, metal protective plates shall be .050" thick; plastic plates shall be 1/8" thick.
C. Protective plates shall be 2" less door width, or 1" less door width at pairs. All protective plates shall be beveled 4 sides and counter sunk. Protection plates over 16" shall not be provided for labeled doors unless specifically approved by door manufacturers listing.
D. Where specified, provide surface mounted door edges. Edges shall butt to protective plates. Provide edges with cutouts as required adjacent hardware.
E. Adjust dimensions of protection plates to accommodate stile and rail dimensions, lite 1 and louver cutouts, and adjacent hardware. Where required by adjacent hardware, protection plates shall be factory drilled for cylinders or other mortised hardware.

2.13 OVERHEAD STOPS

A. Acceptable manufacturers and respective catalog numbers:

Item:	Glynn-Johnson	Rixson	Sargent
1. Heavy Duty Surface Mount	GJ900 Series	9 Series	590
2. Heavy Duty Concealed Mount	GJ100 Series	1 Series	690
3. Medium Duty Surface Mount	GJ450 Series	10 Series	1540
4. Medium Duty Concealed Mount	GJ410	2 Series	1530

B. Unless otherwise specified, furnish GJ900 series overhead stop for hollow metal or 1-3/4” solid core doors equipped with regular arm surface type closers that swing more than 140 degrees before striking a wall, for hollow metal or 1-3/4” solid core doors that open against equipment, casework, sidelights, or other objects that would make wall bumpers inappropriate, and as specified in hardware groups.
C. Furnish sex bolt attachments for wood and mineral core doors unless doors are supplied with proper reinforcing blocks.
D. Provide special stop only (“SE” suffix) overhead stops when used in conjunction with electronic hold open closers.
E. Do not provide holder function for labeled doors.

2.14 WALL STOPS AND HOLDERS

A. Acceptable manufacturers and respective catalog numbers:

Item:	Ives	Hager	Burns
1. Wrought Convex Wall Bumper	WS406CVX	232W	570
2. Wrought Concave Wall Bumper	WS406CCV	236W	575
3. Extended Wall Stop	WS11/WS11X	255W	530
4. Extended Wall Stop	WS33/WS33X	****	****
5. Automatic Wall Holder	WS40	326W	533
6. Hinge Pin Stop	70	****	****

B. Furnish a stop or holder for all doors. Furnish floor stops or hinge pin stops only where specifically specified.

C. Where wall stops are not applicable, furnish overhead stops.

D. Do not provide holder function for labeled doors.

2.15 MAGNETIC HOLD OPENS

A. Acceptable manufacturers and respective catalog numbers:

Item:	LCN	ABH	Edwards
1. Wall Holder	SEM 7800	2000	1500

B. Magnetic hold opens shall be independently certified by ANSI for compliance with ANSI A156.15, Grade 1 (2006).

C. Magnetic holder's housing and armature shall be constructed of a die cast zinc material.

D. Provide types as 1 listed in groups.

E. Where wall conditions do not permit the armature to reach the magnet, provide extensions.

F. Provide proper voltage and power consumption as required by Division 16.

G. Coordinate electrical requirements and mounting locations with other trades.

2.16 WEATHERSTRIP, GASKETING

A. Acceptable manufacturers and respective catalog numbers:

Item:	Zero	Pemko	NGP	Reese
1. Weatherstrip	429	2891_PK	700NA	755
2. Adhesive Gasket	188	S88	5050	797
3. Mullion Seal/Silencer	8780	5110	5100N	
4. Meeting Edge Seals	8193	18041	9605	959
5. Adhesive Edge Seal	****	S77	5060	****
6. Automatic Door Bottom (Surface Mtd.)	321	4131	222	320
7. Automatic Door Bottom (HD Concealed) (When Sealing Against A Solid Surface)	360	434_RL	423N	430
8. Automatic Door Bottom (HD Concealed) (When Sealing Against Carpet)	360	434_NBL	683	943
9. Automatic Door Bottom	355	420APKL	320N	372A
10. Sweeps	8192	18061_NB	B606	964
11. Sweep w/ drip	8198	345_N	C627	354
12. Drip Cap	142	346	16	R201

B. Weatherstrip and gasketing shall be independently certified by ANSI for compliance with ANSI A156.22 (2005).

C. Where specified in the hardware groups, furnish the above products unless otherwise detailed in groups.

D. Provide weatherstripping all exterior doors and where specified.

E. Provide intumescent and other required edge sealing systems as required by individual fire door listings to comply with positive pressure standards UL 10C.

F. Provide Zero 188 smoke gaskets at all fire rated doors and smoke and draft control assemblies.

G. Provide gasketing for all meeting edges on pairs of fire doors. Gasketing shall be compatible with astragal design provided by door supplier as required for specific fire door listings.

2.17 THRESHOLDS

A. Acceptable manufacturers and respective catalog numbers:

Item:	Zero	Pemko	NGP	Reese
1. Saddle Thresholds	8655	171	425	S205
2. Half Saddle Thresholds	1674	227	324	S239
3. Interlocking Threshold	74A	114	442-5	T550

B. Thresholds shall be independently certified by ANSI for compliance with ANSI A156.21 (2001).
C. Hardware supplier shall verify all finish floor conditions and coordinate proper threshold as required to insure a smooth transition between threshold and interior floor finish.
D. Threshold Types:
1. Unless otherwise specified, provide saddle threshold similar to Zero 8655 for all exterior 1 openings with an interior floor finish less than or equal to 1/4" in height.
2. Unless otherwise specified, provide half saddle threshold similar to Zero 1674 for all exterior openings with an interior floor finish greater than 1/4" in height. Threshold height shall match thickness of interior floor finish.

2.18 ELECTRIC STRIKES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Von Duprin	Folger Adams
1. Type 1	6000 Series	300 Series

B. Provide electric strikes designed for use with the type of locks shown at each opening where specified.
C. Electric strikes shall be UL listed as Burglary-Resistant Electric Door Strikes and where required shall be UL listed as Electric Strike for Fire Doors.
D. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.19 POWER SUPPLIES

A. Provide quantities and types as specified in hardware sets. Shared power supplies will not be accepted without prior approval from the owner.
B. All power supplies shall have the following features:
1. 12/24 VDC Output, field selectable.
2. Class 2 Rated power limited output.
3. Universal 120-240 VAC input.
4. Low voltage DC, regulated and filtered.
5. Polarized connector for distribution boards.
6. Fused primary input.
7. AC input and DC output monitoring circuit w/LED indicators.
8. Cover mounted AC Input indication.
9. Tested and certified to meet UL294.
10. NEMA 1 enclosure.
11. Hinged cover w/lock down screws.
12. High voltage protective cover.
C. All power supplies shall incorporate fused distribution boards.
D. All electro-mechanical systems requiring fail safe circuits shall be capable of interfacing with the fire alarm system to cut power to appropriate system components. Unless already provided in another system component, all power supplies utilized in fail safe circuits shall include an integral relay which when connected to the N/C fire alarm contact will cut power to all openings connected to the individual power supply. Power supply, unless otherwise specified, will automatically reset itself when fire alarm relay returns to normal state following a fire alarm.

2.20 DOOR POSITION SWITCHES

A. Acceptable manufacturers and respective catalog numbers:

Item:	Schlage Electronics	Sentrol	Sargent
1. Concealed (wood & hollow metal doors)	679 Series	1076W	3287
2. Concealed (aluminum doors)	7764	*****	****

2.21 FINISHES AND BASE MATERIALS

A. All hollow metal doors and aluminum doors shall be provided with satin chrome hardware with the exception of the front metal door areas at Doty, MLK, and Wilson which shall be provided with bronze hardware. All wood doors shall be provided with bronze hardware.

B. Unless otherwise indicated in the hardware groups or herein, hardware finishes shall be applied over base metals as specified in the following finish schedule:

HARDWARE ITEM	SATIN CHROME BHMA FINISH AND BASE MATERIAL	SATIN BRASS BHMA FINISH AND BASE MATERIAL
1. Butt Hinges: Exterior, or Non-Ferrous	630 (US32D - Satin S.S.)	606 (US4 - Satin Brass)
2. Butt Hinges: Interior	652 (US26D - Satin Chromium)	633 (US4 - Satin Brass)
3. Continuous Hinges	628 (US28 – Anodized Clr. Alum.)	688 (US4 Gold Anodized)
4. Flush Bolts	626 (US26D - Satin Chromium)	606 (US4 - Satin Brass)
5. Exit Devices and Exit Device Trim	626 (US26D - Satin Chromium)	606 (US4 - Satin Brass)
6. Locks and Latches	626 (US26D - Satin Chromium)	606 (US4 - Satin Brass)
7. Pulls and Push Plates/Bars	630 (US32D - Satin S.S.)	606 (US4 - Satin Brass)
8. Coordinators	600 (Prime painted or mill alum.)	600 (Prime painted)
9. Closers	689 (Powder Coat Aluminum)	696 (Powder Coat Brass)
10. Protective Plates	630 (US32D - Satin S.S.)	606 (US4 - Satin Brass)
11. Overhead Stops	630 (US32D - Satin S.S.)	606 (US4 - Satin Brass)
12. Wall Stops and Holders	630 (US32D - Satin S.S.)	606 (US4 - Satin Brass)
13. Thresholds	628 (Mill Aluminum)	628 (Mill Aluminum)
14. Weather-strip, Sweeps Drip Caps (wood and hollow metal doors)	Aluminum Anodized	Gold Anodized
15. Weather-strip, Sweeps Drip Caps (aluminum doors)	Match finish of alum. Doors	Match finish of alum. doors
16. Magnetic Holders	Sprayed Aluminum	Sprayed Aluminum
17. Magnetic Locks	628 (US28)	606 (US4 - Satin Brass)
18. Miscellaneous	626 (US26D - Satin Chromium)	606 (US4 - Satin Brass)

2.22 KEYING

A. Provide all cylinders in keyways as required to accommodate owners existing key system.

B. All locks under this section shall be keyed as directed by the owner to an existing Master Key System.

C. Furnish a total of 2 keys per cylinder. Actual cut keys to be determined by owner.

D. Master keys, control keys, and change keys shall be delivered by registered mail to the owner. Construction keys shall be delivered to the contractor.

2.23 KEY CABINETS

A. Acceptable manufacturers and respective catalog numbers:

Item:	Lund	Key Control	Telkee
1. Key Cabinets	1200-1205 AA	M228-2480	RWC-AWC

B. Furnish one (1) each model 1200 or 1205 AA key cabinet with a capacity 1.5 times the number of key sets.

C. Provide one key cabinet with at least one hook for each key set, plus additional hooks for 50% expansion.

D. Furnish key cabinet complete with cam lock, permanent key tags, and change key cards.

E. Hardware supplier shall prepare all key change index records, tag all keys and place permanent file keys in cabinet.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, installer shall examine door frame installation to insure frames have been set square and plumb. Installer shall examine doors, door frames, and adjacent wall, floor, and ceiling for

conditions, which would adversely affect proper operation and function of door assemblies. Do not proceed with hardware installation until such deficiencies have been corrected.

B. Install all hardware in accordance with the approved hardware schedule and manufacturer's instructions for installation and adjustment.

C. Set units level, plumb and true to the line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accord with industry standards.

E. Drill appropriate size pilot holes for all hardware attached to wood doors and frames.

F. Shim doors as required to maintain proper operating clearance between door and frame.

G. Unless otherwise specified, locate all hardware in accordance with the recommended locations for builder's hardware for standard doors and frames as published by the Door and Hardware Institute.

H. Use only fasteners supplied by or approved by the manufacturer for each respective item of hardware.

I. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.

J. Conceal push and pull bar fasteners where possible. Do not install through bolts through push plates.

K. Install hardware on UL labeled openings in accordance with manufacturer's requirements to maintain the label.

L. Apply self-adhesive gasketing on frame stop at head & latch side and on rabbet of frame at hinge side.

M. Install hardware in accordance with supplemental "S" label instructions on all fire rated openings.

N. Install wall stops to contact lever handles or pulls. Do not mount wall stops on casework, or equipment.

O. Where necessary, adjust doors and hardware as required to eliminate binding between strike 1 and latch bolt. Doors should not rattle.

P. Overhead stops used in conjunction with electrified hold open closers shall be templated and installed to coincide with engagement of closer hold open position.

Q. Install door closers on corridor side of lobby doors, room side of corridor doors, and stair side of stairways.

R. Adjust spring power of door closers to the minimum force required to insure exterior and fire rated doors will consistently close and latch doors under existing conditions. Adjust all other door closers to insure opening force does not to exceed 5 lbs.

S. Adjust "sweep", "latch", & "back check" valves on all door closers to properly control door throughout the opening and closing cycle. Adjust total closing speed as required to comply with all applicable state and local building codes.

T. Install "hardware compatible" (bar stock) type weatherstripping continuously for an uninterrupted seal. Adjust templating for parallel arm door closers, exit devices, etc., as required to accommodate weatherstripping.

U. Unless otherwise specified or detailed, install thresholds with the bevel in vertical alignment with the outside door face. Notch and closely fit thresholds to frame profile. Set thresholds in full bed of sealant.

V. Compress sweep during installation as recommended by sweep manufacturer to facilitate a water-resistant seal.

W. Deliver to the owner 1 complete set of installation and adjustment instructions, and tools as furnished with the hardware.

3.2 FIELD QUALITY CONTROL

A. After installation has been completed, the hardware supplier and manufacturer's representative for locksets, door closers, exit devices, and overhead stops shall check the project and verify compliance with installation instructions, adjustment of all hardware items, and proper application according to the approved hardware schedule. Hardware supplier shall submit a list of all hardware that has not been installed correctly.

B. After installation has been completed, the hardware supplier and manufacturer's representative shall meet with the owner to explain the functions, uses, adjustment, and maintenance of each item of hardware. Hardware supplier shall provide the owner with a copy of all wiring diagrams. Wiring diagrams shall be opening specific and include both a riser diagram and point to point diagram showing all wiring terminations.

3.3 ADJUSTMENT AND CLEANING

A. At final completion, and when H.V.A.C. equipment is in operation, installer shall make final adjustments to and verify proper operation of all door closers and other items of hardware. Lubricate moving parts with type lubrication recommended by the manufacturer.

B. All hardware shall be left clean and in good operation. Hardware found to be disfigured, defective, or inoperative shall be repaired or replaced.

3.4 HARDWARE SCHEDULE

A. The following schedule of hardware groups are intended to describe opening function. The hardware supplier is cautioned to refer to the preamble of this specification for a complete description of all materials and services to be furnished under this section.

END OF SECTION

SECTION 08 71 05
DOOR HARDWARE SCHEDULE

PART 1 – GENERAL – THIS SECTION NOT USED

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. AD - Adams Rite
B. GJ - Glynn-Johnson
C. HA - Hager
D. IV - Ives
E. LC - LCN Closers
F. NG - National Guard
G. RO - Rockwood
H. SC - Schlage
I. SH - Schlage Electronic Security
J. VD - Von Duprin

2.2 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 4 "Door Hardware Schedule" Article to comply with requirements in this Section.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
   2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 4 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
   1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 4 "Door Hardware Schedule" Article.
   2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

PART 3 – EXECUTION – THIS SECTION NOT USED

PART 4 – HARDWARE SETS

Set: 1.0

3	Hinge	BB119 4-1/2” x 4-1/2”	US32D	HA
1	Mortise Lock	L9080 03A	630	SC
1	Surface Closer	4011 REG	AL	LC
1	Wall Stop	WS406CCV	630	IV
1	Threshold	425		NG
1	Gasketing	700NA		NG
1	Sweep	B606A		NG

Set: 1.1

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9080 03A	630	SC
1	Surface Closer	4111 SCUSH	AL	LC
1	Threshold	425		NG
1	Gasketing	700NA		NG
1	Sweep	B606A		NG

Set: 1.2

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9080 03A	630	SC
1	Overhead Holder/Stop	414S	US32D	GJ
1	Surface Closer	4011 REG	AL	LC
1	Threshold	425		NG
1	Gasketing	5050C		NG
1	Sweep	B606A		NG

Set: 2.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9010 03A	630	SC
1	Overhead Holder/Stop	104S	US32D	GJ
1	Surface Closer	4011 REG	AL	LC
1	Gasketing	5050C		NG
1	Sweep	B606A		NG

Set: 2.1

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9010 03A	630	SC
1	Surface Closer	4111 SCUSH	AL	LC
1	Threshold	425		NG
1	Gasketing	700NA		NG
1	Sweep	B606A		NG

Set: 3.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Fire Rated Rim Exit	99L-BE-F 996L-BE	US26D	VD
1	Surface Closer	4011 REG	AL	LC
1	Kick Plate	K1050 10" x 2" LDW	US32D	RO
1	Wall Stop	WS406CCV	630	IV
1	Gasketing	5050C		NG
1	Sweep	600A		NG

Set: 3.1

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Fire Rated Rim Exit	99L-BE-F 996L-BE	US26D	VD
1	Surface Closer	4111 EDA	AL	LC
1	Kick Plate	K1050 10" x 2" LDW	US32D	RO
1	Wall Stop	WS406CCV	630	IV
1	Gasketing	5050C		NG
1	Sweep	600A		NG

Set: 4.0

3	Hinge	BB1199 4-1/2" x 4-1/2"	US32D	HA
1	Fire Rated Rim Exit	99L-NL-F 996L-NL	US26D	VD
1	Cylinder	CYLINDER AS REQUIRED	626	SC
1	Surface Closer	4111 SCUSH	AL	LC
1	Threshold	425		NG
1	Gasketing	5050C		NG
1	Sweep	B606A		NG

Set: 4.1

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Fire Rated Rim Exit	99L-NL-F 996L-NL	US26D	VD
1	Cylinder	CYLINDER AS REQUIRED	626	SC
1	Surface Closer	4111 EDA	AL	LC
1	Wall Stop	WS406CCV	630	IV
1	Threshold	425		NG
1	Gasketing	5050C		NG
1	Sweep	B606A		NG

Set: 5.0

6	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
2	Flush Bolt	FB458	626	IV
1	Mortise Lock	L9070 03A	630	SC
2	Overhead Holder/Stop	104S	US32D	GJ
1	Gasketing	5050C		NG

Set: 6.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9070 03A	630	SC
1	Surface Closer	4011 REG	AL	LC
1	Wall Stop	WS406CCV	630	IV
1	Threshold	425		NG
1	Gasketing	5050C		NG
1	Sweep	B606A		NG

Set: 7.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9040 03A	630	SC
1	Wall Stop	WS406CCV	630	IV

			Set: 7.1		
3	Hinge		BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock		L9040 03A	630	SC
1	Overhead Holder/Stop		414S	US32D	GJ
			Set: 8.0		
6	Hinge		BB1199 4-1/2" x 4-1/2"	US32D	HA
1	Fire Rated Surf Vert Rod		9927L-NL-F LBR 996L-NL	US26D	VD
1	Fire Rated Surf Vert Rod		9927EO-F LBR 990EO(Std)	US26D	VD
1	Cylinder		CYLINDER AS REQUIRED	626	SC
2	Surface Closer		4111 EDA	AL	LC
2	Wall Stop		WS406CCV	630	IV
1	Gasketing		700NA		NG
2	Sweep		B606A		NG
1	Astragal		137NA(SET)		NG
			Set: 9.0		
6	Hinge		BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Flush Bolt		FB31P	630	IV
1	Mortise Lock		L9080 03A	630	SC
1	Coordinator		COR52 FL20	628	IV
2	Surface Closer		4111 SCUSH	AL	LC
1	Threshold		425		NG
1	Gasketing		5050C		NG
2	Sweep		B606A		NG
			Set: 10.0		
3	Hinge		BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock		L9080 03A	630	SC
1	Surface Closer		4111 EDA	AL	LC
1	Wall Stop		WS406CCV	630	IV
1	Gasketing		5050C		NG
			Set: 11.0		
3	Hinge		BB1199 4-1/2" x 4-1/2"	US32D	HA
1	Fire Rated Rim Exit		99NL-F 696NL	US26D	VD
1	Cylinder		CYLINDER AS REQUIRED	626	SC
1	Surface Closer		4111 SCUSH	AL	LC
1	Threshold		425		NG
1	Gasketing		700NA		NG
1	Drip Strip		16A		NG
1	Sweep		B606A		NG

Set: 12.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9050 03A	630	SC
1	Overhead Holder/Stop	104S	US32D	GJ
1	Surface Closer	4011 REG	AL	LC
1	Threshold	425		NG
1	Gasketing	700NA		NG
1	Drip Strip	16A		NG
1	Sweep	B606A		
		NG		

Set: 13.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	L9070 03A	630	SC
1	Wall Stop	WS406CCV	630	IV

Set: 14.0

1	Cylinder	CYLINDER AS REQUIRED	626	SC

Notes: ALL HARDWARE BY DOOR MANUFACTURER

Set: 15.0

2	Continuous Hinge	780-112HD 95"	Clear	HA
1	Threshold Bolt	4015-18-IB	603	AD
1	Header Bolt	4016		AD
1	Header Bolt	4085-02-IB	603	AD
1	Mortise Deadlock	MS1850S	628	AD
1	Cylinder	CYLINDER AS REQUIRED	626	SC
1	Cylinder	4066-01	130	AD
2	Push Bar & Pull	9190HD-33-0	630	IV
2	Overhead Holder/Stop	104S	US32D	GJ
2	Surface Closer	4111 EDA	AL	LC
2	Drop Plate	4110-18	AL	LC
2	Spacer	4110-61	AL	LC
1	Threshold	425		NG
2	Sweep	B606A		NG

Notes: SEALS BY DOOR MANUFACTURER

Set: 16.0

2	Continuous Hinge	780-112HD 95"	Clear	HA
2	Push Bar & Pull	9190HD-33-0	630	IV
2	Surface Closer	4111 EDA	AL	LC
2	Drop Plate	4110-18	AL	LC
2	Spacer	4110-61	AL	LC
1	Threshold	425		NG
2	Sweep	B606A		NG

Notes: SEALS BY DOOR MANUFACTURER

Set: 16.1

2	Continuous Hinge	780-112HD 95"	Clear	HA
2	Vertical Rod Exit Device	8611C	US32D	AD
2	Mortise Cylinder	4036	628	AD
2	Cylinders per Bldg. Std.			
2	Escutcheon Pad	8650	US32D	AD
2	Pull Bar	8103EZHD-2	US32D	IV
2	Concealed Closer	2030-3038HB	689	LC
1	Threshold	425		NG
2	Sweep	201NA		NG

Notes: SEALS BY DOOR MANUFACTURER

Set: 17.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
3	Hinge	BB1191 4-1/2" x 4-1/2" ETW-8	US32D	HA
1	Electrified Mortise Lock	L9092EU RX 03A	630	SC
1	Surface Closer	4011 REG	AL	LC
1	Wall Stop	WS406CCV	630	IV
1	Threshold	425		NG
1	Gasketing	700NA		NG
1	Sweep	B606A		NG
1	Position Switch	679-05		SH

Notes: CARD READER BY SECURITY CONTRACTOR

Set: 18.0

3	Hinge	BB1191 4-1/2" x 4-1/2"	US32D	HA
1	Mortise Lock	LEMD-ADD-X-03	626AM	SC
1	Overhead Holder/Stop	414S	US32D	GJ
1	Wall Stop	WS406CCV	630	IV
3	Door Silencer	SR64	Grey	IV

END OF SECTION

SECTION 08 80 00

GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Glass for doors, interior aluminum frames.
   2. Glazing sealants and accessories.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction adhesion and compatibility test report.

1.6 QUALITY ASSURANCE

A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 PRE-CONSTRUCTION TESTING

A. Pre-construction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.8 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Guardian Industries Corp.; SunGuard.
   2. Oldcastle BuildingEnvelope™.
   3. PPG Flat Glass; PPG Industries, Inc.
   4. Viracon, Inc.
   5. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of Wisconsin, as defined in Section 01 40 00 "Quality Requirements," to design glazing.
B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
   1. Design Wind Pressures: 7.5 psf (all interior to garage)
C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

2.6 GLAZING SEALANTS

A. General:
   1. Compatibility: Compatible with one another and with other materials they contact, including glass products and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Sealant shall have a VOC content of 250 g/L or less.
   4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT or as recommended by glass manufacturer for glazing application.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 – EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
F. Provide spacers for glass lites where length plus width is larger than 50 inches.
G. Provide edge blocking where indicated or needed to prevent glass lites from moving 1 sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
E. Apply heel bead of elastomeric sealant.
F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
    1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
C. Remove and replace glass that is damaged during construction period.

3.6 MONOLITHIC GLASS SCHEDULE

A. Glass Type GL-1; GL-2: Clear float glass, tempered where indicated on the drawings.
    1. Minimum Thickness: Refer to Material Tag index.
    2. Safety glazing required where indicated on the drawings.

3.7 LAMINATED GLASS SCHEDULE

A. Glass Type Component of GL-5, or safety glass alternate to fully tempered safety glass: Clear laminated glass with two plies of annealed float glass.
    1. Minimum Thickness of Each Glass Ply: 6 mm.
    2. Interlayer Thickness: 0.060 inch.
    3. Safety glazing required.

END OF SECTION

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SECTION 08 88 13

FIRE-RESISTANT GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Fire-resistance-rated glazing.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
   2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
C. Glass Samples: For each type of glass product; 12 inches square.
D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.5 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Laminated Glazing Reference Manual" and 1 "Glazing Manual."

B. Safety Glazing Labeling: Permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.2 GLASS PRODUCTS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

2.3 FIRE-RESISTANCE-RATED GLAZING

A. Fire-Resistance-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing according to ASTM E 119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that the glazing is approved for use in walls, and the fire-resistance rating in minutes.

C. Fire resisting Laminated Glass with Intumescent Interlayers, rating as indicated: Laminated glass made from multiple plies of uncoated, ultra-clear float glass; with intumescent interlayers; and complying with 16 CFR 1201, Category II.
   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. Pilkington North America: PyroStop.
      b. SAFTI FIRST Fire Rated Glazing Solutions: SuperLite III-XL.
      c. Technical Glass Products: FireLite PLUS.
      d. Vetrotech Saint-Gobain: SGG Contraflam.
      e. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.4 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing products with which products are used for applications and fire-protection ratings indicated.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.
   1. Sealant shall have a VOC content of 250 g/L or less.
   2. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

PART 3 – EXECUTION

3.1 GLAZING

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
G. Provide spacers for glass lites where length plus width is larger than 50 inches.
H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction 1 operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
    1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
C. Remove and replace glass that is damaged during construction period.

3.3 FIRE-RESESTANCE-RATED GLAZING SCHEDULE

A. Glass Type (FRGL-1): 120-minute fire-resistance-rated glazing with 450 deg F temperature-rise limitation; laminated glass with intumescent interlayers.

END OF SECTION

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SECTION 08 88 53

SECURITY GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes forced entry security laminated glass.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on security glazing, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For sealants, indicating VOC content.
C. Security Glazing Samples: For each type of security glazing; 12 inches square.
D. Security Glazing Schedule: List security glazing types and thicknesses for each size opening and location. Use same designations indicated on Drawings. Indicate coordinated dimensions of security glazing and construction that receives security glazing, including clearances and glazing channel dimensions.
E. Delegated-Design Submittal: For security glazing indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of security glazing, for tests performed by a qualified testing agency.
B. Preconstruction adhesion and compatibility test reports.

1.6 PRE-CONSTRUCTION TESTING

A. Pre-construction Adhesion and Compatibility Testing: Test each security glazing type, tape sealant, gasket, glazing accessory, and glazing-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing will not be required if data based on previous testing of current sealant products and glazing materials match those submitted.

1.7 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated glass that deteriorates within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer licensed in the State of Wisconsin, as defined in Section 01 40 00 "Quality Requirements," to design security glazing.
B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated.
   1. Design Procedure for Glass: ASTM E 1300 and ICC's International Building Code.
   2. Design Wind Pressures: 25 psf.
C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.2 SECURITY GLAZING, GENERAL

A. Glazing Publications: Comply with published recommendations of security glazing and glazing material manufacturers and organizations below unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glazing, glass thickness, and safety glazing standard with which glazing complies.

2.3 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

2.4 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Interlayer Thickness: Provide thickness not less than as needed to comply with requirements.
2. Interlayer Color: Clear.

2.5 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they contact, including security glazing, seals of insulating security glazing and air-gap security glazing, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and security glazing manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Sealant shall have a VOC content of 250 g/L or less.
   4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Security Sealant: Manufacturer's standard, non-sag, tamper-resistant sealant for joints with low movement complying with ASTM C 920, Grade NS, Class 12.5 or 25, Use NT, and with a Shore A hardness of at least 45 when tested according to ASTM C 661.
   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. BASF Corporation; Construction Systems.
      b. Pecora Corporation.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and security glazing manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
   2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
   1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
   2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by security glazing manufacturer to maintain security glazing lites in place for installation indicated.

D. Edge Blocks: Elastomeric material of hardness needed to limit security glazing lateral movement (side walking).

E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF SECURITY GLAZING

A. Fabricate security glazing in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 – EXECUTION

3.1 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of security glazing, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Protect edges of security glazing from damage during handling and installation. Remove damaged security glazing from Project site and legally dispose of off Project site. Damaged security glazing includes units with edge or face damage or other imperfections that, when installed, could weaken security glazing and impair performance and appearance.
C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glazing unit manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
E. Do not exceed edge pressures stipulated by security glazing manufacturers for installing lites.
F. Provide spacers for security glazing lites where the length plus width is larger than 50 inches.
G. Provide edge blocking where indicated or needed to prevent security glazing from moving sideways in glazing channel, as recommended in writing by security glazing manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by security glazing, their exposed edges are flush with or protrude slightly above sightline of stops.
B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
E. Do not remove release paper from tape until just before each glazing unit is installed.
F. Apply heel bead of elastomeric sealant.
G. Center security glazing in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.3 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between security glazing and glazing stops to maintain face clearances and to prevent sealant from extruding into glazing channel and blocking weep systems. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to security glazing and channel surfaces.
C. Tool exposed surfaces of sealants to provide a substantial wash-away from security glazing.

3.4 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.
B. Protect security glazing from contact with contaminating substances resulting from construction operations, including weld splatter.
    1. If, despite such protection, contaminating substances do come into contact with security glazing, remove substances immediately as recommended in writing by security glazing manufacturer. Remove and replace security glazing that cannot be cleaned without damage.

3.5 LAMINATED-GLASS SECURITY GLAZING SCHEDULE

A. Security Glazing (Type SGL-1): Clear laminated glass.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis of Design: Oldcastle BuildingEnvelope® ArmorProtect® Plus #121000.
3. Type SG-FE1 - Glass-clad polycarbonate, Clear: Inner and outer lites shall be 3mm heat strengthened glass with a single ply polycarbonate core. Overall nominal thickness shall be 7/16". Product shall comply with:
   a. HPW-TP-0500, Forced Entry Level 1 and Ballistics Level A, 0.38 Special (ballistics stoppage spall penetration).

END OF SECTION

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SECTION 08 91 19

FIXED LOUVERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes fixed, extruded-aluminum louvers.
B. Related Requirements:
   1. Section 08 11 13 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
   2. Section 08 14 16 "Flush Wood Doors" for louvers in flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
C. Samples: For each type of metal finish required.
D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on tests performed according to AMCA 500-L.
B. Windborne-debris-impact-resistance test reports.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer licensed in the State of Wisconsin, using structural performance requirements and design criteria indicated.
B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
   1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
   2. Wind Loads: Determine loads based on a uniform pressure acting inward or outward.
      a. Refer to drawings.
C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

2.2 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Airolite Company, LLC (The).
      b. Greenheck Fan Corporation.
      c. Ruskin Company.
      d. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
B. Fixed-Blade Extruded-Aluminum Louvers: Horizontal Drainable-Blade Louvers as manufactured by The Airolite Co. (Basis of Design).
   1. Product: K6776:
      a. Depth: 6 inches (152 mm) nominal louver depth.
      b. Type: Concealed mullion.
      c. Percent Free Area: 54%.
      d. Beginning Point of Water Penetration: 1,250 fpm (6.35 m/s).
      e. Air Volume Flow Rate at Beginning Point of Water Penetration: 10,700 cfm (5.06 m³/s).
      f. Pressure Drop at Beginning Point of Water Penetration: 0.18 in. H2O (0.045 kPa).
      g. Blade Thickness: 0.081 in (2 mm) 0.125 in (3 mm).
      h. Frame Thickness: 0.081 in (2 mm) 0.125 in (3 mm)
   2. AMCA Seal: Mark units with AMCA Certified Ratings Seal.
   3. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.3 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening.
B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are attached.
C. Louver Screening for Aluminum Louvers:
   1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.4 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
C. Fasteners: Use types and sizes to suit unit installation conditions.
   1. Use hex-head or Phillips pan-head screws for interior exposed fasteners unless otherwise indicated. Do not use exterior exposed fasteners.
   2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
   3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.

4. For fastening stainless steel, use 300 series stainless-steel fasteners.
5. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.6 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Match Architect's sample.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

3.2 ADJUSTING

A. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION

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SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior partitions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.

1.4 INFORMATION SUBMITTALS

A. Evaluation reports for firestop tracks.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 35 percent.
   1. Minimum Recycled Content: 34.9%.
   2. Minimum Post-Consumer Recycled Content: 24.3%.
   3. Minimum Pre-Consumer (Post Industrial) Recycled Content: 9.4%.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
   2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645.
   1. Steel Studs and Runners:
      a. Minimum Base-Metal Thickness: 0.0179 inch.
      b. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide the following:
   1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

F. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

G. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 FURRING

A. Refer to Drawings for type and size.

B. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.0296 inch.
   2. Depth: As indicated on Drawings.

C. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch-thick, in width to suit steel stud size.

PART 3 – EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

E. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c. unless noted otherwise.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

H. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

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SECTION 09 29 00
GYPSUM BOARD

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Interior gypsum board.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer 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. Product Data: For adhesives and sealants, indicating VOC content.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Gypsum board products shall be GREENGUARD Gold Certified.
B. Regional Materials: Products shall be manufactured within 300 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 300 miles of Project site.
C. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.
B. Gypsum Board, Type X: ASTM C 1396/C 1396M (GYP-3 and GYP-4).
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.
   3. Acoustical isolation hangers: where applicable for wall designation on the drawings, use the following product in the assembly per the detail drawings: Acoustical Surfaces Inc.: RSIC-1 Resilient Sound Isolation Clips at 16” o.c.
C. Gypsum Board, Abuse Resistant, Type X: ASTM C 1278 (USG Tile Backerboard and Underlayment)
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
   2. Shapes:
      a. Cornerbead.
      b. Bullnose bead.
      c. LC-Bead: J-shaped; exposed long flange receives joint compound.
      d. L-Bead: L-shaped; exposed long flange receives joint compound.
      e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      f. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.
B. Joint Tape:
   1. Interior Gypsum Board: Paper.
C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
B. Polyethylene Vapor Retarders: ASTM D 4397, 6-mil- (0.15-mm-) thick sheet, with maximum permeance rating of 0.1 perm (5.7 ng/Pa x s x sq. m).
C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   2. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 50 percent.

E. Acoustical Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Sealant shall have a VOC content of 250 g/L or less.

F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 – EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C 840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Prefill open joints, rounded or beveled edges, and damaged surface areas.

F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
   2. Level 3: not required.
   3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
      a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
   4. Level 5: not required.

3.2 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

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SECTION 09 30 10
TILE SHOWER COMPONENTS AND WATERPROOFING MEMBRANE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Waterproofing Membranes.
B. Floor Drains with Integrated Bonding Flange.
C. Prefabricated Shower Components.
D. Waterproof Building Panel for Ceramic and Stone Tile

1.2 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Catalog information, component sizes, rough-in requirements, service sizes, and finishes.
   3. Storage and handling requirements and recommendations.
   4. Installation Instructions.
C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and finish.
D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.
B. Source Limitations for Materials and Accessories: Obtain product of a uniform quality for each application condition from a single manufacturer.
C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.
D. Preinstallation Conference: Conduct conference at the Project site.
   1. Convene one week prior to commencing work of this section.
   2. Require attendance of installation material manufacturer, plumber, waterproofing installer, tile installer and installers of related work. Review installation procedures and coordination required with related work.

3. Meeting agenda includes but is not limited to:
    a. Drain location.
    b. Prefabricated substrate requirements.
    c. Drainage membrane requirements.
    d. Tile and installation material compatibility.
    e. Edge protection, transition and pre-fabricated movement joint profiles.
    f. Waterproofing techniques.
    g. Crack isolation techniques.

1.4 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Schluter Systems LP; 194 Pleasant Ridge Rd., Plattsburgh, NY. Telephone: (800) 472-4588; Fax: 800-477-9783; Email: request info (specassist@schluter.com); Web: www.schluter.com.
B. Acceptable Manufacturer: Laticrete International, Inc.; 1 Laticrete Park N., Bethany, CT. Telephone: (800) 243-4788; Fax: (203) 393-1684. Website: https://laticrete.com/en.
C. Acceptable Manufacturer: FinPan Inc.; 3255 Symmes Road, Hamilton, OH. Telephone: (800) 833-6444; Fax: (513) 870-9606. Website: www.finpan.com.
D. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 WATERPROOFING MEMBRANE

A. Schluter-KERDI
    1. Description: 0.008 inch (0.2 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides, which is listed by UPC to meet or exceed requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10 and is listed by UPC, and is evaluated by ICC-ES (see Report No. ESR-2467).
    2. Corners and seals:
        a. Provide matching preformed inside corners.
        b. Provide matching preformed pipe seals.
        c. Provide matching preformed mixing valve seals.
B. Schluter-KERDI-BAND
    1. Description: Seams and Corners material 0.004 inch (0.1 mm) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.
    2. Width:

2.3 FLOOR DRAINS WITH INTEGRATED BONDING FLANGE

A. Schluter-KERDI-DRAIN, Stainless Steel:
    1. Description: stainless steel floor drain 9-27/32 inch (250 mm) diameter integrated bonding flange with 3 inch (75 mm) no-hub outlet, and grate assembly. Grate assembly includes stainless steel grate, height adjustment collar, and lateral adjustment ring with trapezoid perforations.
    2. Drain listed by UPC to meet requirements of "International Association of Plumbing and Mechanical Officials Interim Guide Criteria for Floor Drain with Integrated Bonding Flange" (IGC 195), listed by CSA to meet requirements of the Canadian Standards Association standard, "Floor, Area, and Shower

Drains, and Cleanouts for Residential Construction" (CSA B79), Drain detail as referenced in method B422 and B422C of the Tile Council of North America Handbook for Ceramic Tile Installation.

3. Drain Housing Material:
   a. Stainless Steel.
4. Grate Material and Finish:
   a. E - Stainless Steel Type 304 = V2A.
5. Nominal Grate Size:
   a. 4-inch (100 mm) by 4 inch (100 mm) square.
6. Drain Outlet:
   a. 2-inch (50 mm) outlet.
   b. 2-inch Threaded stainless steel (50 mm) outlet.
   c. Match existing conditions.

B. Schluter -KERDI-DRAIN ADAPTER (as needed), Stainless Steel:
   1. Description:
      a. Floor drain adaptor kit consisting of stainless steel adaptor ring with over-molded santoprene gasket, 9.843-inch (250 mm) diameter sloped integrated bonding flange, and grate assembly. Grate assembly includes stainless steel grate, height adjustment collar, and lateral adjustment ring with trapezoid perforations.
      b. Drain detail as referenced in method B 422 and B422C of the Tile Council of North America Handbook for Ceramic Tile Installation.
   2. Drain Housing Material:
      a. Stainless Steel.
   3. Grate Material and Finish:
      a. E - Stainless Steel Type 304 = V2A.
   4. Nominal Grate Size:
      a. 4-inch (100 mm) by 4-inch (100 mm) square.

2.4 PREFABRICATED SHOWER COMPONENTS

A. Schluter-KERDI-SHOWER-ST (as needed)
   1. Description: trapezoid-imprinted, prefabricated, sloped tiled shower tray base, made of 2.75 lb/ft3 (44 kg/m3) density, self-extinguishing (HF-1 rating per UL-94) expanded polystyrene, with 12-5/16-inch (313 mm) diameter removable recessed section with 1/8 inch (3 mm) wide ribs on top and channels on the underside.
   2. Size: As needed to match design intent and drain placement.

B. Schluter-KERDI-SHOWER-SC
   1. Description: trapezoid-imprinted, prefabricated, tiled shower curb base, made of 2.75 lb/ft3 (44 kg/m3) density, self-extinguishing (HF-1 rating per UL-94) expanded polystyrene.
   2. Curb dimensions are 48-inch by 6-inch by 4-1/2-inch (1220 mm by 150 mm by 115 mm).

C. Schluter-KERDI-BOARD-SC
   1. Description: Prefabricated waterproof Shower Curb, constructed of rigid extruded polystyrene foam building element panel, with reinforcement material and polypropylene fleece webbing laminated on both sides for thin-set ceramic tile and dimension stone Installations.
      a. KBSC 115 150 970 - 38 inch by 6-inch by 4-1/2 inch (970 mm by 150 mm by 115 mm).
      b. KBSC 115 150 1220 - 48 inch by 6-inch by 4-1/2 inch (122 cm by 150 mm by 115 mm).

D. Schluter-KERDI-FIX
   1. Description: single-component, elastomeric, waterproof sealing and bonding compound with a silane-modified polymer base. Compound is free of solvents and odorless.
   2. Color: As selected by Architect from manufacturer’s standard colors.

2.5 WATERPROOF BUILDING PANEL FOR CERAMIC AND STONE TILE

A. Schluter-KERDI-BOARD (as needed to comply with manufacturer’s installation instructions and warranty information)
   1. Description: Rigid extruded polystyrene foam building element panel, with reinforcement material and polypropylene fleece webbing laminated on both sides for thin-set ceramic tile and dimension stone Installations.

2. Panel Thickness:
    a. Thickness as required.
3. Panel Size:
    a. Size as required.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. Verify drain location and compatibility with drain system specified.
C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces by removing all debris, sharp edges and protrusion that could damage the waterproof integrity of the system.
C. 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 in accordance with manufacturer's instructions.
B. Coordinate Work with installation of prefabricated shower and floor drains specified in Section 22 40 00 – Plumbing Fixtures and with setting materials for floor finish materials specified in Section 09 30 13 – Ceramic Tiling.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 09 30 13
CERAMIC TILING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Ceramic mosaic wall tile.
   2. Porcelain floor tile.
   3. Stone thresholds.
   4. Tile base and caps
   5. Metal edge strips and trim.

B. Related Requirements:
   1. Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   2. Section 09 29 00 "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

D. Module Size: Actual tile size plus joint width indicated.
E. Face Size: Actual tile size, excluding spacer lugs.

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
   2. Product Data for Credit IEQ 4.3: For grout sealers, documentation indicating that products comply with requirements of FloorScore certification.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: Show locations of each type of tile and tile pattern for typical applications. Show widths, details, and locations of industry recommended expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces for specific room by room applications.
D. Samples:
   1. Each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
   3. Stone thresholds.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Foreman or supervising installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
   2. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.
B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of each type of floor tile installation.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 – PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

A. Ceramic Tile Type: glazed ceramic wall tile.
   1. Composition: Ceramic.
   2. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
   3. Module Size: TBD.
   4. Grout Color: Match Architect's sample.
   5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
      a. Trim Units:
         i. External Corners for thinset Mortar Installations
         ii. Internal Corners for thinset Mortar Installations.

B. Ceramic Tile Type: Porcelain floor tile.
   1. Refer to material Tag List.
   2. Certification: Tile certified by the Porcelain Tile Certification Agency.
   3. Face Size: 12” x 12”
   4. Face Size Variation: Rectified.
   5. Dynamic Coefficient of Friction: Not less than 0.42.
   6. Grout Color: Match Architect's sample.

2.3 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or no greater than 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.

2.4 WATERPROOF MEMBRANE

A. Application: Provide at bathroom floors.
   1. For waterproofing of built-in showers and bike wash station, see Section 09 30 10 – Tile Shower Components and Waterproofing Membrane.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bonsal American, an Oldcastle company.
   2. LATICRETE LLC.
   3. MAPEI Corporation.

C. General: Manufacturer's standard product, selected from the following that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

D. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
   1. Basis of Design: Laticrete Hydroban.

2.5 SETTING MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bonsal American, an Oldcastle company.
   2. LATICRETE LLC.
   3. MAPEI Corporation.

B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field mixed portland cement and aggregate mortar bed.
    a. Basis of Design: Laticrete 3701 Mortar Admixture.

C. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
1. Product shall be approved for setting beds up to 5/8 inch.
    a. Basis of Design: Laticrete 253 Gold (bagged).
2. Provide prepackaged, dry-mortar mix containing dry, re-dispersible, vinyl acetate or acrylic additive to which only water is added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid latex additive at Project site.
4. For large format floor tile (tile of 8 inches by 8 inches or greater) provide medium setting bed to achieve 100% coverage.
5. For wall applications, provide mortar that complies with requirements for non-sagging mortar in addition to the other requirements in ANSI A118.4.

2.6 GROUT MATERIALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. MAPEI Corporation; Kerapoxy IEG CQ.
2. LATICRETE LLC; Spectralock Pro Premium Grout.
3. Bostik Inc.; EzPoxy EzClean.
4. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. High-Performance Epoxy Tile Grout: ANSI A118.3.
1. An epoxy composition, essentially a 100 percent solid system, that is supplied in two or more parts to be mixed immediately before use as a setting adhesive and joint filling grout for ceramic tile, and that is partially emulsified by water, after mixing, in order to expedite cleaning from tile surfaces during application before the epoxy hardens.
2. Joint widths from 1/16-inch to 1/2-inch:
    a. Basis of Design: Laticrete.

C. Grout for Pre-Grouted Tile Sheets: Same product used in factory to pre-grout tile sheets.

D. Color: As selected by Architect from manufacturer’s standard.

2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint 1 locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
   1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors consisting of tiles 8 by 8 inches or larger.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
   1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thinset).

I. Metal Edge Strips: Install at locations indicated.

J. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
    1. Remove grout residue from tile as soon as possible.
    2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.5 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.6 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:
    1. Ceramic Tile Installation: TCNA F112 and ANSI A108.1A; cement mortar bed (thickset) bonded to concrete.
        a. Ceramic Tile Type:
        b. Grout: High-performance grout.
    2. Ceramic Tile Installation: TCNA F113; thinset mortar.
        a. Ceramic Tile Type:
        b. Thinset Mortar: Latex- portland cement mortar.
        c. Mediumset Mortar: Latex- portland cement mortar. Large format tile.
        d. Grout: High-performance grout. Color as selected.
        e. Grout Sealer: As specified.
B. Interior Wall Installations, Metal Studs or Furring:
    1. Ceramic Tile Installation:
        a. Ceramic Tile Type: Refer Material Tag List.
        b. Thinset Mortar: Improved modified dry-set mortar.
        c. Grout: High-performance grout. Color as selected.

END OF SECTION

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.
B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Recycled content.
   2. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, 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 panels equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until wet-work in spaces is complete and dry, work above ceilings is complete.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Armstrong World Industries, Inc.
   2. CertainTeed Corporation.
   3. United States Gypsum Company.
   4. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

B. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E 1264.
   2. Smoke-Developed Index: 450 or less.

2.3 ACOUSTICAL PANELS

A. Basis of Design:
   1. Manufacturer: USG
   2. Pattern: Astro

B. Material Characteristics:
   1. Material: Mineral Fiber, Wet-formed.
   2. ASTM Classification: Type: IV, Form: 2, Pattern: E.
   3. Texture: Fine.
   4. Pattern: No Pattern.
   5. Surface Finish: Factory-applied latex paint on acoustically transparent membrane.
   6. Dimensions: 24- x 24- x 3/4-inches.
   7. Edge Profile: Fineline Bevel
   8. NRC: 0.70
   9. Grid: 9/16-inch.

2.4 METAL SUSPENSION SYSTEM

A. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
B. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
C. Narrow-profile, slotted grid system with 1/8" reveal, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; pre-painted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges. USG Donn® Brand Fineline® DXLF™ 9/16" Acoustical Suspension System
    1. Structural Classification: Intermediate-duty system.
    2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
    3. Face Design: Slotted.
    4. Cap Material: Cold-rolled steel.
    5. Cap Finish: Painted white.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
    1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
        a. Type: Post-installed bonded anchors.
        b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
B. Wire Hangers, Braces, and Ties: Provide wires as follows:
    1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
    2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

3.2 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
    1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
    2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
    3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.6 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections

that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. 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 54 60
LINEAR METAL CEILING SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Perforated and non-perforated metal ceiling panels
   2. Acoustical backing
   3. Suspension systems
   4. Accessories; provide other necessary items including devices for attachment overhead construction, secondary members, splines, splices, connecting clips, wall connectors, wall angles, and other devices required for a complete installation.
   5. Supplemental support framing: Provide fully engineered secondary framing as required to meet code, conforming to layout shown in drawings, to support direct-hung metal ceilings suspension system.

B. Related Sections / Work:
   1. Sections 05 40 00 – Cold-Formed Metal Framing
   2. Sections 09 29 00 – Gypsum Board
   3. Sections 09 51 13 – Acoustical Panel Ceilings
   4. Sections 09 91 13 – Exterior Painting
   5. Division 23 – Heating, Ventilating and Air Conditioning
   6. Division 26 – Electrical

C. This Section covers the general requirements only for Acoustical Metal Ceilings as shown on the drawings. The supplying and installation of additional accessory features and other items not specifically mentioned herein, but which are necessary to make a complete installation, shall also be included or clarified accordingly.

D. Qualification Data:
   1. Test Reports: Certified reports from independent agency substantiating structural compliance to windloads and other governing requirements.
   2. Certificates:
      a. Data substantiating manufacturer and installer qualifications.

b. Certified data attesting fire rated materials comply with specifications.
3. Manufacturer's Instructions: Detailed installation instructions and maintenance data.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
1. E 84 – "Standard Test Method for Surface Burning Characteristics of Building Materials"
2. E 488 – "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements"
3. B 209 – "Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate"
4. C 423 – "Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method"
5. E 580 – "Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint"
6. C 635 – "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings"
7. C 636 – "Recommended Practice for Installation of Metal Ceiling Suspensions Systems for Acoustical and Lay-in Panels"
8. A 641 – "Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire"
9. A 653 – "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip process"
10. E 1264 – "Classification for Acoustical Ceiling Products"
11. E 1477 – "Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by use of Integrating-Sphere Reflectometers"
12. D 1044 – "Practice for Abrasion Resistance"
13. D 1002 – "Practice for Adhesion Resistance"

1.4 SUBMITTALS

A. Product Data: Manufacturer's published literature, including specifications.
B. Product Certification: Manufacturer's certifications that products comply with specified requirements and governing codes including product data, laboratory test reports and research reports showing compliance with specified standards.
C. Shop Drawings: Submit shop drawings for reflected ceiling plans (RCP's), drawn to scale, and indicating penetrations and ceiling mounted items. Show the following details:
1. Reflected Ceiling Plan(s): Indicating metal ceiling layout, ceiling mounted items and penetrations.
2. Suspension System, Carrier and Component Layout.
3. Details of system assembly and connections to building components.
D. Samples for Verification: Full-size units (or as specified below) of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Submit samples for each type specified.
1. 11-ich square metal panel units.
2. 11-inch long samples of each exposed molding or trim.
3. 11-inch long samples of each suspension component.

1.5 QUALITY ASSURANCE

A. Manufacturer/Installer Qualifications:
1. Provide metal ceiling system components produced by a single manufacturer with a minimum 5 years' experience in actual production of specified products and with resources to provide consistent quality in appearance and physical properties, without delaying the work.
2. Provide suspension system components produced by a single manufacturer to provide compatible components for a complete metal ceiling system installation.
3. Perform installations using a firm with installers having no less than 3 years of successful experience on projects of similar size and requirements.
B. Regulatory Requirements:
1. Fire Rating Performance Characteristics: Install system to provide a flame spread of 0-25, complying with certified testing to ASTM E 84.

2. Structural Criteria: Install and certify system to comply with structural and wind load requirements of governing codes.
3. Installation Standard for Suspension System: Comply with ASTM C 636.

C. Mock-Up: Prior to beginning installation erect a mock-up section, where directed, using all system components.

D. Pre-installation Conference: Conduct a conference, prior to start of installation, to review system requirements, shop drawings, and all coordination needs.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver system components in manufacturer's original unopened packages, clearly labeled.

B. Store components in fully enclosed dry space. Carefully place on skids, to prevent damage from moisture and other construction activities.

C. Handle components to prevent damage to surfaces and edges, and to prevent distortion and other physical damage.

1.7 PROJECT CONDITIONS

A. Begin system installations only after spaces are enclosed and weather-tight, and after all wet work and overhead work have been completed.

B. Prior to starting installations, allow materials to reach ambient room temperature and humidity intended to be maintained for occupancy.

1.8 WARRANTY

A. Provide specified manufacturer's warranty against defects in workmanship, discoloration, or other defect considered undesirable by the Architect or Employer.

B. This warranty shall remain in effect for a minimum period of one (1) year from date of initial acceptance.

1.9 MAINTENANCE & EXTRA MATERIALS

A. Maintenance Instructions: Provide manufacturer's standard maintenance and cleaning instructions for finishes provided.

B. Extra Materials: Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Only typical system components are included with attic stock.

1. Acoustical Metal Ceiling Pan Units: Full-size units equal to two percent (2%) of amount installed.
2. Ceiling Suspension System Components: Quantity of each grid and exposed component equal to two percent (2%) of amount installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Hunter Douglas Architectural Box linear metal panel ceiling system manufactured by Hunter Douglas Architectural, Inc., 5015 Oakbrook Parkway, Suite 100, Norcross, GA 30093, USA (800) 366-4327.

B. Rockfon Linear Metal Ceilings, 4849 S. Austin Avenue, Chicago, IL 60638; Tel: (800) 323-7164; Website: www.rockfon.com.

C. Alumiline by Acoustical Surfaces Inc., 123 Columbia Court N., Suite 201, Chaska, MN 55318; Tel: (800) 526-3138; Website: www.acousticalsurfaces.com.

D. Substitutions allowed per section 012300 – Product Substitution Procedures.

2.2 SYSTEM MATERIALS

A. Linear metal panel ceiling system for **exterior** installations:

1. Panel Profile Type: Box 4, roll formed, .032" exterior thick aluminum with square edges; 3-5/32-inches wide, 17/32-inches deep with 27/32-inch reveal to form a 4-inch module.
2. Panel length: Minimum 3-foot; maximum 16-foot.
3. Closure: Flat Recessed Closure: 5/8-inch wide roll-formed aluminum hat-shaped closure panel to snap-fit between ceiling panels.
4. Recessed Closure required for exterior applications.
   a. Finish: White.

B. Linear Suspension System:
1. Carrier: Universal hat-shaped, 0.038-inch roll-formed aluminum section with hook-shaped tabs spaced to receive ceiling panels at 2-inches on-center and 27/32-inches apart. Support holes spaced 4-inches on-center. Finish: Factory-applied black enamel.
2. Hanger Wire: 12-gage galvanized carbon steel hanger wire.
3. Seismic/Wind Uplift Compression Struts: 1-1/2-inches (38 mm) deep, 16 Ga., cold-rolled steel "C" channels.

C. Perforations on painted finish options only: #160

D. Panel Finish:
1. Paint; color to be selected by architect
   a. Powder Coat

2.3 ACCESSORY MATERIALS

A. Panel End Caps: Formed, stamped, or milled end caps with matching finish

B. Panel Splice: Formed aluminum insert designed to snap-fit between ends of two ceiling panels. Finish: black

C. Access Door: 2-foot x 2-foot aluminum access frame with hinges and retainer clip for downward-acting access panel to plenum space.

D. Acoustic Material – interior only:
1. NRC Rating:

E. Air Distribution Devices: Provide distribution devices that are independently suspended, adjustable from below finished ceiling, capable of being concealed behind (invisible to view) and fully integrated with ceiling system to allow no interruption of ceiling components.

F. Lighting Fixtures Modular Type "M" or "MT" flange and HVAC diffusers: Optional.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical metal panels attach or abut, with installer present, for compliance with requirements specified in this and other Sections that affect installation and anchorage, and other conditions affecting performance of metal panel ceilings.

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

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical metal pan units to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

C. Survey substrate for wall attachment to assure squareness and proper elevation for wall panel installation.

3.3 INSTALLATION

A. General: Install acoustical metal pan ceilings, per manufacturers shop drawings provided, per manufacturer's written instructions and to comply with publications referenced below.
1. CISCA "Ceiling Systems Handbook"
2. Standard for Ceiling Suspension System Installations - ASTM C 636

3. Standard for Ceiling Suspension Systems Requiring Seismic Restraint - ASTM E 580
4. IBC (International Building Code) Standard for Seismic Zone for local area

B. Suspend ceiling hangers from building's approved structural substrates and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produce hanger spacings that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Utilize supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Where used secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Space hangers not more than 48-inches on-center, along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 12-inches from ends of each member. Supply supporting calculations from licensed Structural Engineer verifying hanger spacing meets all requirements, when spacing exceeds those recommended.
6. Level grid to 1/8-inch in 10-feet from specified elevation(s), square and true.
7. Adjust suspension system runners so they are square (within 0.5 degree from 90 degrees) and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

C. Secure bracing wires to ceiling suspension members and to supports acceptable to Architect/Engineer and/or inspector. Suspend bracing from building's structural members and/or structural deck, as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs (unless directed otherwise).

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical metal pan. Method of edge trim attachment and design of edge trims to be approved by Architect.
1. Screw attach moldings to substrate at intervals not more than 18-inches on-center and not more than 6-inches from ends, leveling with ceding suspension system to a tolerance of 1/8-inch in 10-feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim without prior written approval, or unless detailed otherwise.

E. Scribe and cut acoustical metal panel units for accurate fit at penetrations by other work through ceilings. Stiffen edges of cut units as required to eliminate evidence of buckling or variations in flatness exceeding referenced standards for stretcher-leveled metal sheet.

F. Install acoustical metal panel units in coordination with suspension system. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating ceiling.

3.4 ADJUST AND CLEAN

A. Adjust components to provide uniform tolerances.

B. Replace all ceiling panels that are scratched, dented or otherwise damaged.

C. Clean exposed surfaces with non-solvent, non-abrasive commercial type cleaner.

END OF SECTION

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SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Resilient base.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For adhesives, indicating VOC content.
C. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

PART 2 – PRODUCTS

2.1 THERMOSET-RUBBER BASE

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. Johnsonite Inc. - A Tarkett Company, 30000 Aurora Road, Solon, OH 44139; Tel: (800) 899-8916; Website: www.johnsonite.com.
   2. Burke Flooring Products, 2250 S. 10th Street, San Jose, CA 95112; Tel: (800) 447-8442 Ext. 1036; Website: www.burkeflooring.com.
   3. Roppe Corporation, 1602 N. Union Street, P.O. Box 1158, Fostoria, OH 44830-1158; Tel: (800) 537-9527; Website: www.roppe.com.
   4. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.
B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
   1. Style and Location:
      a. Style B, Coved.
C. Thickness: 0.125 inch.
D. Height: 4 inches.
E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.
H. Colors: 63 Burnt Umber.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less and 60 g/L or less for rubber stair treads.

PART 3 – EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
B. Do not install resilient products until they are the same temperature as the space where they are to be installed.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.
F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
G. Preformed Corners: Install preformed corners before installing straight pieces.
H. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 6 inches in length.
      a. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Miter or cope corners to minimize open joints.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

END OF SECTION

SECTION 09 65 19

RESILIENT TILE FLOORING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid vinyl floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.
C. Samples: Full-size units of each color and pattern of floor tile required.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
B. Performance:
   1. Hardness (ASTM D 2240) – Not less than 85 Shore A.
   2. Abrasion Resistance (ASTM D 3389): < 1.0 gm weight loss
   3. Slip Resistance (ASTM D 2047): Meets or Exceeds a static coefficient of friction of 0.8
   4. Color Heat Stability (ASTM F 1514): < 8.0 Delta E
   5. Static Load Limit (ASTM F 970): Passes at 250 PSI with less than .005” residual indentation
   6. Acoustical: ASTM E- 492 Impact Insulation Class – 40 IIC
   7. Fire Resistance:
      a. ASTM E 648/NFPA 253 (Critical Radiant Flux), Class 1.
      b. ASTM E 662/NFPA 258 (Smoke Density), less than 450.
   8. Chemical Resistance (ASTM F 925): Passed - 5% Acetic acid, 70% Isopropyl alcohol, Sodium hydroxide solution (5% NaOH), Hydrochloric acid solution (5% HCl), Sulfuric acid solution (5% H_2SO_4),

Household ammonia solution (5% NH4OH), Household 1 bleach (5.25% NaOCl), Disinfectant cleaner (5% active phenol).

2.2 SOLID VINYL FLOOR TILE

A. Tile Standard: ASTM F 1700.
   1. Class: Class I, monolithic vinyl tile.
   2. Type: A, smooth surface.
B. Thickness: 0.125 inch.
C. Size: 24 by 24 inches.
D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 RUBBER FLOOR TILE

A. Basis of Design: Tarkett Folio Rubber Tile.
B. Construction: Floor Tiles shall be manufactured from a homogeneous composition of 100% synthetic rubber, high quality additives, and colorants to meet the performance requirements of ASTM F 1344, Class 1-A and 1-B Standard Specification for Rubber Floor Tile.
C. Thickness: 0.125-inch (3 mm) thickness.
D. Size: 24 inches x 24 inches (61 cm x 61 cm).
E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 – EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.
B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
    1. Lay tiles square with room axis.
C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
    1. Lay tiles with grain running in one direction.
D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
B. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
    1. Apply two coats.
C. Cover floor tile until Substantial Completion.

END OF SECTION

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SECTION 09 91 13

EXTERIOR PAINTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior environment within the garage vehicular parking space.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
2. Section 05 53 13 "Bar Gratings" for shop priming metal gratings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.5 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.

1.6 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. Davis Paint Company.
   3. Diamond Vogel Paints.
   4. Glidden Professional.
   5. Sherwin Williams.
   6. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 PAINT, GENERAL

A. 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.
B. Colors: As indicated in a color schedule.
C. Low-Emitting Materials: Architectural paints and coatings applied to walls and ceilings shall not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.

2.3 STAINS

A. Concrete stains for parking garage structure:
   1. 100% Acrylic emulsion wall stain:
      a. Product: Loxon Vertical Concrete Stain as manufactured by Sherwin Williams.
      b. Product: PERMA-CRETE® Vertical Concrete Stain VCS as manufactured by PPG Paints.
         i. Sheen: Flat 0 to 5 (85º Gloss Meter)
         ii. Cleanup: Soap and Water
         iii. Volume Solids*: 39% +/- 2%
         iv. Weight Solids*: 53% +/- 2%
         v. Viscosity*: 93 to 103 KU
         vi. VOC*: 85 g/L (0.71 lbs./gal.)

vii. DRY FILM/COAT: 1.5 mils to 3.2 mils
viii. DRYING TIME: Dry time @ 70ºF (21ºC); 50% relative humidity
a) To Recoat: 15 minutes
b) To Full Cure: 30 days

2.4 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 – EXECUTION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
D. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
C. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 STAIN SYSTEMS

A. Basis of Design Product: Pittsburgh Paints Perma-Crete Vertical Concrete Stain VCS 4-5100 Series.
B. Concrete: Cast-In-Place Concrete including but limited to ceilings, columns, surfaces contiguous to traffic coating and miscellaneous concrete surfaces.
   1. Primer; None required.
   2. Stain: Pittsburgh Paints Perma-Crete Vertical Concrete Stain VCS 4-5100 Series.
   3. Coats: Provide 2 coat application at DFT recommended by manufacturer.

3.7 PAINT SYSTEMS

A. Concrete: Cast-In-Place Concrete including but limited to ceilings, columns, surfaces contiguous to traffic coating and miscellaneous concrete surfaces.
   1. Basis of Design: Sherwin Williams.
   2. Dryfall Waterborne Topcoats:
      a. Flat Finish:
         i. 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series.
         ii. 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-80 Series (6 mils wet, 1.7 mils dry per coat).
B. CMU Substrates:
   1. Water-Based Light Industrial Coating System:
      a. Prime Coat: Block filler, latex, interior/exterior.
      b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
      c. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3).
      d. Topcoat: Light industrial coating, exterior, water based, semi-gloss (MPI Gloss Level 5).
      e. Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6).

END OF SECTION

SECTION 099120
PARKING PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract Drawings and general provisions of the Contract.

1.2 SUMMARY

A. This Section includes surface preparation and application of paint systems for the high build, two coat systems for the items of types, patterns, sizes, and colors described in this article.

B. Provide the following systems as shown on Drawings:
   1. Parking Stall Stripes.
   2. Traffic Arrows, crosswalks, accessible stall access aisles, walkways, symbols, stop bars, words and other markings.
   3. International Symbol of Accessibility.

C. Provide painting of curbs and curb ramps as described in the following paragraphs:
   1. Paint vertical surface and the first 6 in. of the abutting horizontal surface at the top of all curbs and islands (including PARCS equipment islands) within parking facility except those which do not exceed 3’0” in width and abut a wall, spandrel panel, bumper wall guardrail or other construction (not including landscaping or equipment) which prevents passage of pedestrians.
   2. In parking areas, paint curb ramps (including flares), curb returns at curb ramps and any projecting elements at edges of accessible ramps without handrails.
   3. Paint color for curbs and curb ramps shall be yellow.

D. Proportion International Symbol of Accessibility in accordance with ICC A117.1-2009 Accessible and Usable Buildings or 2010 ADA Standards for Accessible Design.

E. Related Work:
   1. Pavement Marking Contractor shall verify compatibility with sealers, joint sealants, caulking and all other surface treatments as specified in Division 07.

1.3 SUBMITTALS

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

B. Provide product data as follows:
   1. Manufacturer’s certification that the material complies with standards referenced within this Section.
   2. Intended paint use.
   3. Pigment type and content.
   4. Vehicle type and content.

C. Submit list of similar projects (minimum of 5) where pavement-marking paint has been in use for a period of not less than 2 yrs.

D. Submittals and resubmittals: Engineer will review each of Contractor’s shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify the reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be

responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's service made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

E. Request for Information:

1. Engineer reserves the right to reject any Request for Information (RFI) that the Engineer, at its sole discretion, deem frivolous.
2. Engineer reserves the right to reject, any RFI that the Engineer, at tis sole discretion, deems already answered in the Contract Documents.
3. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the contract documents.

1.4 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

1.5 QUALITY ASSURANCE

A. Provide written 1-year warranty to Owner that pavement markings will be free of defects due to workmanship, inadequate surface preparation, and materials including, but not limited to, fading and/or loss of markings due to abrasion, peeling, bubbling and/or delamination. Excessive delamination, peeling, bubbling or abrasion loss shall be defined as more than 15% loss of marking material within one year of substantial completion and/or occupancy of the parking area. With no additional cost to Owner, repair and/or recoat all pavement marking where defects develop or appear during warranty period and all damage to other Work due to such defects.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement marking materials shall meet Federal, State and Local environmental standards.

B. Paint shall be manufactured and formulated from first grade raw materials and shall be free from defects or imperfections that might adversely affect product serviceability.

C. Paints shall comply with the National Organic Compound Emission Standards for Architectural Coatings, Environmental Protection Agency, 40 CFR Part 59.

D. The product shall not contain mercury, lead, hexavalent chromium, or halogenated solvents.

2.2 PAVEMENT MARKING PAINTS:

A. Solvent based paint may be employed for yellow pavement markings and shall meet the requirements of MPI #32

B. 100% acrylic waterborne paint for special color pavement markings (blue, green, red, black) shall meet requirements of Federal Specification TT-P-1952E. Special color marking materials shall be compatible with the white and yellow pavement markings where they are layered.

2.3 COLOR OF PAINT

A. Color of paint, unless noted otherwise on Contract Drawings, shall be yellow and shall match federal color chip No. 33538. Color shall have daylight directional reflectance (without glass beads) of not less than 50% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

B. Paint color for blue accessible parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 35180. Color shall have daylight directional reflectance (without glass beads) of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

C. Paint color for green special-use parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 34108. Color shall have daylight directional reflectance (without glass beads) of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

D. Paint color for red special-use parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 31136. Color shall have daylight directional reflectance (without glass beads)

of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

E. Paint color for black special-use pavement markings, if shown on Contract Drawings, shall match federal color chip No. 37038. Black paint shall also meet Federal Specification TT-P-110.

2.4 BEADS

A. Use Glass Beads (Spheres) in all pavement markings except stall striping lines. Conform to Federal Specification TT-B-1325D, Type I. Broadcast beads into markings at rate not less than 6 lbs. per gallon of paint.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

D. Striping shall not be placed until full cure of concrete slab and sealer. Concrete surfaces generally require 30 to 90 days @ 70°F or higher. Sealers (other than silane) generally require 14 days @ 70°F or higher. Silane sealers require 24 hrs @ 70°F or higher. Bituminous surfaces generally require 30 days @ 45° F or higher.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Do not paint or finish any surface that is wet or damp.

C. Clean substrates of substances that could impair bond of paints, including dirt, dust, oil, grease, and incompatible paints and encapsulants.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Lay out all striping on each tier, using dimensions and details shown on Contract Drawings, before painting that tier. Report any discrepancies, interferences or changes in striping due to field conditions to Engineer/Architect prior to painting. Pavement Marking Contractor shall be required to remove paint, repair surface treatment and repaint stripes not applied in strict accordance with Contract Drawings.

F. Work Areas:
   1. Store, mix and prepare paints only in areas designated by Contractor for that purpose.
   2. Provide clean cans and buckets required for mixing paints and for receiving rags and other waste materials associated with painting. Clean buckets regularly. At close of each day's Work, remove used rags and other waste materials associated with painting.
   3. Take precautions to prevent fire in or around painting materials. Provide and maintain appropriate hand fire extinguisher near paint storage and mixing area.

G. Mixing:
   1. Do not intermix materials of different character or different manufacturer.
   2. Do not thin material except as recommended by manufacturer.

H. Disposal:
   1. Contractor shall properly dispose of unused materials and containers in compliance with Federal Resource Conservation Recovery Act (RCRA) of 1976 as amended, and all other applicable laws and regulations.

3.3 APPLICATION

A. Apply paint in 2-coat system; first coat shall be 50% of total 15 wet mil minimum thickness, not to exceed 8 mils. First coat shall be cured prior to installation of second coat. At Contractor's option, one coat may be applied before substantial completion, with a second coat delayed for 3-6 months until weather conditions are appropriate and the concrete has cured sufficiently for proper adhesion.
   1. Two coat system total wet mil thickness of 0.015 in (0.381 mm).

2. Two coat system total wet mil thickness of 0.018 to 0.025 in (0.457 – 0.635 mm) When Type IVA beads are used.
3. Two coat system total wet mil thickness of 0.015 to 0.018 in (0.381 – 0.457 mm) When Type IVB beads are used.

B. Apply painting and finishing materials in accordance with manufacturer's directions. Use applications and techniques best suited for material and surfaces to which applied. Minimum air shall be used to prevent overspray. Temperature during application shall be minimum of 40º F and rising, unless manufacturer requires higher minimum temperature. Maximum relative humidity shall be as required by manufacturer.

C. Application of beads and/or silica sand shall coincide with application of paint, but shall be done as separate operation by a suitable dispenser. Sand may be premixed with paint for application to curbs only. Glass beads and silica sand shall adhere to the cured paint or all marking operations shall cease until corrections are made.

D. All lines shall be straight, true, and sharp without fuzzy edges, overspray or non-uniform application. Corners shall be at right angles, unless shown otherwise, with no overlaps. Line width shall be uniform (-0%, +5% from specified width). No excessive humping (more material in middle than at edges or vice versa).

END OF SECTION

SECTION 09 91 23

INTERIOR PAINTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems in conditioned spaces only on the following interior substrates:
   1. Concrete.
   2. Concrete masonry units (CMUs).
   3. Steel and iron.
   4. Galvanized metal.
   5. Gypsum board.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
B. Sustainable Design Submittals:
   1. Product Data: For paints and coatings, indicating VOC content.
C. Samples: For each type of paint system and in each color and gloss of topcoat.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work:
   1. Benjamin Moore & Co.
   2. Hallman Lindsay Paints, Inc.
   3. PPG: including their Dulux/ICI Paints, AkzoNobel.
   4. Sherwin-Williams Company (The), including their Valspar range.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
B. 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.
C. Low-Emitting Materials: Architectural paints and coatings applied to walls and ceilings shall not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, 1st Edition, May 20, 1993.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Masonry (Clay and CMUs): 12 percent.
   3. Gypsum Board: 12 percent.
C. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:
   1. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
      a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 2), MPI #143.

B. CMU Substrates:
   1. Institutional Low-Odor/VOC Latex System MPI INT 3.1M:
      a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 2), MPI #143.

C. Steel Substrates:
   1. Institutional Low-Odor/VOC Latex System MPI INT 5.1S:
      a. Prime Coat: Primer, rust inhibitive, water based MPI #107.
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 2), MPI #144.

D. Gypsum Board and Plaster Substrates:
   1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
      a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 2), MPI #143.

E. Insulation-Covering Substrates: Including pipe and duct coverings.
   1. Institutional Low-Odor/VOC Dryfall Latex System MPI INT 10.1D:
      a. Prime Coat: Primer sealer, latex, interior, MPI #50.
      b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
      c. Topcoat: Latex, interior, institutional low odor/VOC, flat (MPI Gloss Level 2), MPI #143.

END OF SECTION

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SECTION 09 96 53
ELASTOMERIC WATERPROOF COATINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Elastomeric, breathable waterproof (high performance) coatings on cast-in-place concrete and concrete unit masonry as shown on the Drawings and specified herein including but not necessarily limited to the following:
   1. Cleaning and removal of surface form release materials, dirt, and other contaminates that would affect the proper application and adhesion of sealants and coatings.
   2. Inspection of surfaces to be coated by the Manufacturer's representative prior to and during application and at the completion of the work.
   3. Application of sealants and associated materials to prepare cracks covered by the elastomeric coating.
   4. Applying compatible sealants and accessories in all construction joints, expansion joints, control joints, window perimeter joints and joints abutting materials other than those to be coated.
   5. Applying required primers to concrete and masonry surfaces.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric coating systems with the following properties as determined by the test methods indicated:
   1. Elongation at Break: Not less than 280 percent at 77 degrees F and not less than 50 percent at 0 degrees F according to ASTM D 412.
   2. Low-Temperature Flexibility: Passes a 1/8-inch 180-degree mandrel bend at minus 15 degrees F at 20 mil dry film thickness according to ASTM C 711.
   3. Water-Vapor Transmission: Not less than 2.0 perms according to ASTM E 96.
   4. Wind-Driven Rain Resistance: No water penetration according to procedures in FS TT-C-555.
   5. Minimum Solids Content by Volume: Not less than 45 percent.

1.3 QUALITY ASSURANCE

A. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the work.

B. Provide materials and methods of application in accordance with the current printed instructions and specifications of the coating manufacturer except as hereafter modified and as approved by the coating manufacturer.
C. Provide materials and products specified herein for elastomeric waterproof coating as the products of one manufacturer to ensure compatibility, uniformity and warrant ability of the waterproof coating application.
D. The coating applicator is to be an approved and/or certified by the coating manufacturer and is provide evidence of same upon request.
E. The manufacturer of the coating is to provide a representative for inspecting the surfaces to be coated and to verify existing conditions of the proposed installation are in compliance with the manufacturer's requirements prior to application. The manufacturer's representative is also to inspect the installation during application and upon completion of the coating to ascertain that the coating has been installed in accordance with the manufacturer's printed application instructions, this specification and is acceptable for issuing a written warranty.

1.4 1.4 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:
1. Manufacturer's Literature: Materials description, installation instructions and specifications for materials used for coating, primer, sealant and crack repair materials.
2. Product Test Reports: From a qualified independent testing and inspecting agency indicating compliance of elastomeric coatings with requirements based on comprehensive testing within the last 2 years of current product formulations.
3. Shop Drawings: Details of crack and joint treatment, indicating materials and dimensions.
4. Samples:
a. Two (2), 12-inch by 12-inch samples of coating material on 1/8-inch-thick masonite, applied at the specified minimum dry film thickness and surface finish.
b. Color Samples: 3 manufacturer's standard color selection charts showing the full range of available colors and finishes for selection by the Architect.
5. Warranty: 3 signed copies in form and content indicated.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's unopened containers identified to show name, brand, mixing and application instructions. Store and protect containers from damage.
B. Immediately removed from the job site damaged or otherwise unsuitable materials when so ascertained.
C. Provide storage area with temperature not below 45 degrees nor exceeding 90 degrees F.

1.6 MOCK-UP APPLICATION

A. Before proceeding with the work, apply a sample area of approximately 100 sq ft, including, primer and typical crack repairs as specified herein, to an area as directed by the Architect.
B. The mock-up application will be witnessed by the Architect and Owner's Representative, and after review will be used as a guide for method of application and visual appearance of the finished work.
C. Record the location of the sample application on the record document drawings.

1.7 PROJECT CONDITIONS

A. Pre-construction Meeting:
1. Arrange a meeting at the site with the Architect. Require Subcontractor and Manufacturer’s representative to attend.
2. Review project requirements (Drawings, Specifications, and other Contract Documents).
3. Review required submittals, both completed and yet to be completed, including color (or colors) selected.
4. Review condition of substrate work, surface cleaning, crack repair, sealant work, drying of surfaces to be coated, and similar considerations.
5. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.

6. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
7. Review procedures needed for protection of adjacent property and materials during the remedial work and application period.
8. Review availability of each part of building and access requirements.
9. Establish a schedule for each area of the building to be started and completed.

B. Weather and Material Conditions:
1. Proceed with elastomeric coating only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with requirements and the manufacturer's recommendations.
2. Concrete and masonry surfaces, atmospheric and coating material are not be to lower than 40 degrees F. Apply materials only in dry weather. Provide surfaces clean and dry prior to application.

C. Protection:
1. Provide protection of the existing construction from damage by the coating operations. Provide temporary protection (polyethylene sheets or strippable masking) to areas, finishes and elements of the building that would be damaged by contact with coating materials.
2. Clean repair or replace construction so damaged as reviewed by the Architect.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace elastomeric coatings that fail within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Water penetration through the coating.
b. Deterioration of coating beyond normal weathering.
2. Warranty Period: Five (5) years from date of Substantial Completion.

B. The Manufacturer's Warranty is to be fully paid for the Special Coatings Contractor. The Warranty is to cover both labor and materials, without financial limits, required to remove defective materials and recoat areas in which moisture has penetrated structurally sound materials.

C. Provide warranty signed by the Contractor, Coating Applicator and Special Coating Manufacturer.

D. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. BASF Building Systems.
B. Sherwin-Williams Company (The).
C. Sika.
D. Sto Corp.
E. Thoro Systems.
F. Tnemec Company, Inc.

2.2 MATERIALS

A. Elastomeric Waterproof Coating: Water base acrylic polymer, breathable elastomeric waterproof coating, non-textured, low gloss.
1. Sonneborn Colorflex, BASF.
2. Conflex XL Smooth Coating, Sherwin-Williams.
3. Dikagard 550W, Sika.
4. Stolastic, Sto.
5. Thorolastic, Thoro.
6. Enviro-Crete Series, Tnemec.

B. Material Compatibility: Provide crack fillers, block fillers, primers, elastomeric finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
C. Material Quality: Provide the manufacturer's best-quality elastomeric coating material complying with requirements of FS TT-C-555. Material containers not displaying manufacturer's product identification are not acceptable.
D. Primer: Synthetic resin sealer composed of alkyd resin and aliphatic hydrocarbon solvents, as standard product of coating manufacturer.
E. Crack Repair Materials: Acrylic emulsion elastomeric patching compound, one of the following:
    1. Patching Compound No. 748 (Smooth, Knife Grade) & No. 750 (Smooth, Brush Grade), as manufactured by BASF Building Systems.
    2. Sika Top or Sika Surface Fillers, Sika.
    3. Thorlastic Knife Grade/Brush Grade, Thoro.
    4. Or other as approved by Architect.
F. Sealant: Two component urethane, non-sag, elastomeric sealant, complying with ASTM C 920, Type M, Grade NS, Class 25, compatible and approved by the coating manufacturer.
G. Joint Filler and Bond Breaker Tape: As recommended by the sealant and coating manufacturer.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine all surfaces of the installation prior to application of materials. If deteriorated or unsuitable surfaces or conditions are encountered, immediately contact the Architect. The Architect will inspect the work and determine the corrective repairs or work required. Repair work for such conditions will be performed by others.
B. Coating work shall not proceed until unsatisfactory conditions are corrected and inspected by the Coating Manufacturer's Representative. Installation of the elastomeric waterproof coating and associated materials of the application shall constitute acceptance of the existing conditions and construction.

3.2 SURFACE PREPARATION

A. Cleaning:
    1. Pressure clean with water (minimum 21,000 psi) concrete surfaces to be coated. Remove dust, dirt, form release materials, grease, oil, loose particles, laitance form release agents and other surface contaminants and materials that would adversely affect the application, curing, adhesion and waterproofing performance of the coating.
    2. If surface conditions require, wash surfaces vigorously with a solution of one tablespoon of mild detergent and 1 to 2 pints of liquid bleach in 1 gallon of clean water or with other materials as recommended by the coating manufacturer. Rinse surfaces thoroughly with clean water and follow procedures for surface cleaning above.
    3. Allow surfaces to thoroughly dry (not less than 24 hours) before proceeding with coating application.
B. Crack Repair:
    1. For cracks greater than 1/16-inch-wide: Chip or grid out cracks and remove all dust and loose material. Fill and pack crack with knife grade crack patching compound. Apply brush grade patching compound over the crack mounding it approximately 1/4 inch directly over the crack. Extend the brush grade patching compound beyond the crack approximately 4 inches on each side, feather edges with brush or sponge. Match adjacent surface texture to reduce telegraphing of crack patching.
    2. Dynamic or moving cracks: Route or grind out to 1/4-inch-wide x 1/4 inch deep. Fill crack with specified sealant and tool. Allow sealant to cure, then patch crack surface as specified above (No.1).
    3. For cracks smaller than 1/16-inch-wide: Apply knife or brush grade patching compound over the crack, bridging the crack. Mound up to 1/4-inch-thick over the crack and feather out edges on both sides of crack.
    4. Parapets: Repair cracks in parapets down to the point of roof membrane termination the same as for walls.

5. Column to Spandrel: Clean joint of loose material and non-compatible previously place sealants. Install bond breaker tape and sealant over joint between column and spandrel. Tool sealant to a concave shaped fillet.

C. Sealant Work:
1. Remove non-compatible sealants in all joints within the areas to be coated or which are in joints of abutting adjacent materials or construction, such as the control joints, expansion joints and perimeter joints around windows and other openings.
2. Seal all such joints where the waterproofing coating will contact sealant joints and at the juncture of the coating on other materials with the specified sealant material and joint filler (where required).

3.3 PRIMER APPLICATION

A. Apply primer in accordance with the manufacturer's printed instructions for the materials being coated.
B. Apply primer at a rate of not less than 250 to 400 sq. ft. per gallon. Do not apply primer to build a glaze (sheen), a thin spray applied or rolled coat is sufficient.
C. Allow primer to dry for not less than 4 hours before coating with elastomeric waterproof coating.

3.4 COATING APPLICATION

A. Apply elastomeric waterproof coating in accordance with the manufacturer's printed instructions for the materials being coated.
B. Stir and mix material in accordance with label instructions prior to application. Apply material using manufacturer approved brushes and rollers.
C. Cover and protect all surfaces and materials that could be damaged by coating materials and operations of the application.
D. Apply elastomeric waterproof coating to all exposed concrete and concrete masonry surfaces at a rate not less than that recommended by the manufacturer’s printed application instructions, in two coats to produce a uniform coating recommended by the elastomeric coating manufacturer but not less than 8 mils total dry film coating thickness.
E. Apply coating material to produce a pinhole free surface. Apply coating material in fan-like pattern to achieve a uniform surface and thickness. Allow the first coat to dry before applying the second coat.

3.5 FIELD QUALITY CONTROL

A. The Architect and Elastomeric Coating Manufacturer's Representative will determine during the course of the coating work whether the material installation and the workmanship used in the work actually comply with the requirements of the Manufacture's Printed Instructions, the Contract Documents and the Quality Assurance as stated in Article 1.3 of this Section.
B. Deficiencies:
1. Where inspections indicate deficiencies in the work, or non-compliance with this specification, the manufacturer specifications and the reviewed shop drawings, prepare recommendations for additional or remedial work to compensate for deficiencies. The Architect will review recommendations made by the Elastomeric Coating Manufacturer's Representative prior to proceeding with remedial work.
2. When directed in writing by the Architect and Elastomeric Coating Manufacturer, proceed with additional or remedial work as required to compensate for deficiencies at no additional cost to the Owner.

3.6 CLEANING

A. Upon completion of this part of the work, remove all rubbish and debris as well as temporary coverings and maskings. Clean all adjoining surfaces, parts of the building and surrounding building areas soiled or stained due to coating operations.
B. Immediately clean window glass that get coated during application with mineral spirits or other methods and materials approved by the Coating Manufacturer.

END OF SECTION

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SECTION 10 14 00
PARKING SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, apply to this Section.

1.2 SUMMARY

A. This Section includes following types of signs:
1. Reflective vehicular directional and information signs (V- Signs).
2. Retroreflective regulatory signs (R- Signs).
3. Non-reflective pedestrian directional and informational signs (PP- Signs).
4. Pedestrian Supergraphic Signs (PS- Signs).
5. PVC Pipe Clearance Signs (PVC- Signs).
6. Vandal-resistant Signs (VR- Signs).
7. Traffic Controller Signs (TC- Signs).
8. Dynamic Message Signs (DM- Signs).
9. Internally-Illuminated Signs (I- Signs).

B. Related Sections include following:
1. Division 14 Section “Elevators” for elevator door jamb markings and “In Case of Fire…” signage.
2. Division 26 Section “Interior Lighting” for illuminated exit signs.
3. See Division 26 Sections for electrical service and connections for electrified and/or illuminated signs and/or letters.

1.3 SUBMITTALS

A. General: Submit following in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Product Data: Include manufacturer’s construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, mounting heights, anchors, grounds, reinforcement, accessories, layout, spacing, dimensions and installation details.
1. Provide message list, typestyles, graphic elements, including tactile characters and Braille and artwork as shown on drawings, and layout of lettering. Include large scale details of sign layout.
2. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed as a unit of Work in other Sections.
3. Wiring Diagrams from manufacturer of electrified signs for power, signal and control wiring.

D. Samples: Provide following samples of each sign component for verification of compliance with requirements indicated.

1. Samples of each sign material type (V-, R-, PP-, VR-, etc), on not less than 6-in. squares of extrusion, sheet or plate, showing full range of colors to be provided.

E. Maintenance Data: For signage cleaning and maintenance requirements to be included in maintenance manual.

F. Submittals and resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify the reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's service made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

G. Request for Information:
1. Engineer reserves the right to reject any Request for Information (RFI) that the Engineer, at its sole discretion, deem frivolous.
2. Engineer reserves the right to reject, any RFI that the Engineer, at tis sole discretion, deems already answered in the Contract Documents.
3. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the contract documents.

1.4 QUALITY ASSURANCE

A. Qualifications: Manufacturers: Only pre-approved manufacturers as listed herein allowed. Sign manufacturer shall have completed a minimum of 3 projects in last 3 years with similar materials and methods of manufacture as required for this project.

B. Where warranties are required, manufacturer and/or installers shall be authorized by the entity providing the warranty.

C. All completed signs shall be free from defects in materials and workmanship and effectively present specified or permitted message under both day and night viewing conditions. Sign faces shall be reasonably smooth, shall exhibit uniform color and brightness over entire background surface and shall not appear mottled, streaked, or stained when viewed either in ordinary daylight or incidental beams of automobile headlamps.

D. Support structures for signs that are free-standing or extending from any exterior surface of the building, including but not limited to the roof level parking signs on cantilever supports, shall be designed by a licensed professional engineer in the State of Wisconsin in accordance with ASCE 7-98's requirements for wind loads.

E. Internally illuminated or electrified sign cases (, TC-, CM-, DM-, and I-): Housing shall be waterproof and shall comply with NEMA Standards Publication 250-Enclosures for Electrical Equipment, for Type 4 enclosures.

F. Electrical Components, Devices and Accessories: All components shall be listed and labeled by UL and shall comply with NEMA and NFPA standards.

G. Electrical Service: Sign contractor shall review electrical drawings and coordinate with electrical contractor for any minor changes to design and installation of equipment and/or electrical service for powering signs and/or illumination thereof. If change order(s) are possible, use the Request for Information process.

H. Regulatory Requirements:
1. Comply with Americans with Disabilities Act (ADA) and state and local codes as adopted by authorities having jurisdiction.
2. MUTCD:
a. Regulatory R- signs shall be fully compliant with all requirements of the Manual on Uniform Traffic Control Devices (MUTCD) except that sign size may be modified due to space constraints.

I. Single-Source Responsibility: For each separate required type of sign as defined herein, obtain signs from a single firm specializing in this type of work so that there will be undivided responsibility for such work.

J. Design Criteria: Drawings indicate sizes, profiles, and dimensional requirements of signs. Other signs with deviations from indicated dimensions and profiles may be considered, provided deviations do not change design concept. Burden of proof of equality is on proposer.

K. Coordinate sign placement with structural configuration and lighting location. Before sign installation, arrange meeting with Engineer/Architect and lighting installer at site to review sign placement. Additional compensation not allowed for relocating signs after installation if relocation required due to conflicts with lighting or structure.

L. Trade Names: Do not display manufacturer's name, trade name, trademarks, or similar markings on exterior or visible surfaces.

M. Sign Quantity Count: Sign Fabricator shall be responsible for determining the final quantity count of all signs, as indicated on the Signage Schedule and Location Plans, prior to fabrication.

N. Provide written 5 year full replacement warranty to Owner that all signage will be free of defects due to workmanship and materials including, but not limited to, fading, peeling, delamination, and installation. With no additional cost to Owner, repair all defects that develop during warranty period and all damage to other Work due to such defects. NOTE: Additional warranties apply to specific sign types and products, as specified herein.

O. Finishes Warranty: Submit five-year written warranty, signed by the Contractor and Installer, warranting that the architectural signage finishes will not develop excessive fading or excessive non-uniformity of color or shade and will not crack, peel, pit or corrode or otherwise fail as a result in defects, within the warranty period, make necessary repairs or replacement at the convenience of the owner or facility's management.

1. "Excessive Fading": A change in appearance which is perceptible and objectionable as determined by the Designer when visually compared with the original color range standards.
2. "Excessive Non-Uniformity": Non-Uniform fading during the period of the guarantee, to the extent that adjacent panels have a color difference greater that the original acceptance range of color.
3. "Will Not Pit or Otherwise Corrode": No Pitting or other type of corrosion discernible from a distance of 10'-0", resulting from the natural elements in the atmosphere at the project site.

P. Replacement or Repairs: The owner or facilities management shall have the right to continue use of the defective part until such time that the part is replaced or repaired without loss or inconvenience to the owner or facility's management. Warranties shall also state that the replaced or repaired part shall have a warranty period equal to the remaining warranty period for the replaced or repaired part plus an additional one year.

1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting and mounting. Where sizes of signs may be affected by dimensions of surfaces on which they are installed, verify dimensions by field measurement. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

1.6 COORDINATION

A. For signs to be supported by or anchored to permanent construction, provide installers with specific requirements for anchorage devices. Furnish templates for installation.

B. Coordinate location of remote transformers with building construction. Ensure that transformers are accessible after completion of Work.

1.7 MAINTENANCE

A. Maintenance Instruction: Furnish maintenance manual to instruct the owner or facility's management personnel in procedures to be followed in cleaning and maintaining the signage. Provide manufacturer's brochures describing the actual materials used in the Work, including metal alloys and finishes.

1. Include a list of cleaning materials appropriate for continued cleaning of signs. Include written instructions for proper maintenance, service access, replacement procedures, etc. Include recommended methods for removal of residual adhesives from wall surfaces after removal of adhesive mounted signs.

B. Extra Materials: Deliver to the owner or facility's management in manufacturer's original packaging and store at the project site where directed.

1. Furnish one quart of each finish paint color for touch-up purposes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Product: Where named products are specified, subject to compliance with requirements specific to this project, provide either named product or an equivalent product by other manufacturers specified.

B. Manufacturers: Subject to compliance with requirements specific to this project, accepted manufacturers listed in Part 2 are considered to have been prequalified in conformance with paragraph 1.4.A and B of this section. Acceptable manufacturers include, but are not limited to the following:

1. Manufacturers of panel signs, including V-,R-, PP-,PS- and, VR- signs:
   a. ABC Architectural Signing System, Division of Nelson-Harkins Industries.
   b. Alcan Composites, Benton, KY.
   c. Allenite, A Division of Allen Marking Products, Inc.
   d. Andco Industries Corp.

e. APCO Graphics, Inc.
f. Architectural Graphics, Inc.
g. ASI Sign Systems, Inc.
h. Best Manufacturing Co.
i. Interstate Highway Sign Corp.
j. Henry Graphics.
k. Britten Studios.
l. Pannier Graphics.
m. Tapco.
n. Vomar.
o. Signs + Decal Corp., Brooklyn, NY
p. Takeform, Medina, NY

2. Manufacturers of TC-, and DM- signs:
   a. National Sign & Signal Company.
   b. C.J. Hood Co.
   c. Colite Industries, Inc.
   d. Daktronics.
   e. Signal Tech (formerly Howard Industries).
   f. 3M Dynamic Message Signs (formerly American Electronic Sign).
3. Manufacturers of I- signs:
   a. Andco Industries Corp.
   b. ASI Sign Systems, Inc.
   c. Interstate Highway Sign Company.
   d. Vomar.
   e. Signs + Decal Corp., Brooklyn, NY

2.2 MATERIALS

A. Graphics:
1. Graphics shall be highest quality with sharp lines and smooth curves. Images shall be uniform colors and free from streaks or spotting.
2. Silk screening: Where specified or permitted, silk screening shall be highest quality, with sharp lines, no sawtooths, or uneven ink coverage.
   a. Screens shall be photographically reproduced.
   b. Background ink shall be process inks as recommended by manufacturer of substrate employed.
   c. Ink application through screens: 1 flood pass and 1 print pass. Images: uniform color and ink thickness; free from squeegee marks and lines.
   d. Signs: dry in adequate racks with 2 in. spacing for ample air flow and forced air drying and curing.
   e. Package signs only after they have dried completely per ink manufacturer's time allowances.
   f. Where reflective messages are specified or permitted to be reverse silk-screened with a non-reflective, opaque background, the sheeting material shall be 3M Scotchlite Engineer Grade Reflective Sheeting Series 3200 or equivalent meeting US Department of Transportation Standard Specification for Construction of Roads and Bridges on Federal Highway Products, 1985 FP-85, Type II, Section 718.01.
   g. Where reflective messages are specified or permitted to be reverse silk-screened with a reflective, transparent background, the sheeting material shall be 3M Scotchlite High Intensity Grade Sheeting Series 3930 or equivalent meeting US Department of Transportation Standard Specification for Construction of Roads and Bridges on Federal Highway Products, 1985 FP-85, Type IIIA, Section 718.01.

3. Pressure applied graphics:
   a. Where pressure-applied graphics applied to a painted background are specified or permitted, the paint shall be flat, opaque acrylic polyurethane as recommended by manufacturer of substrate and graphic media.
   b. Where pressure-applied, reflective graphics on an opaque painted background are specified or permitted, letters shall be digitally produced, and cut by electronic cutting machines from 3M Scotchlite Electrocut Engineer Grade Sheeting Series 3260 material, colors as noted on drawings or equivalent. Edges shall be sealed per manufacturer recommendation.
   c. Where pressure-applied, reflective graphics on a reflective background are specified or permitted, the sheeting material shall be 3930 Hi Intensity Prismatic or equivalent meeting

US Department of Transportation Standard Specification for Construction of Roads and Bridges on Federal Highway Products, 1985 FP-85, Type IIIA, Section 718.01. The letters shall be digitally produced, and cut by electronic cutting machines from 3M Scotchlite Electronic Cutable Film Series 1170, colors as noted on drawings or equivalent.

d. Where pressure-applied, non-reflective graphics are specified, letters shall be digitally produced, and cut by computer-driven processes from 3M Scotchcal Electrocut 7725 film.

e. Where electronically cut letters and symbols are specified, the inside corners shall be rounded using the largest radius consistent with acceptable appearance. Minimum radius shall be 1/8 inch on a 3 inch letter. Use prespacing tape as recommended by manufacturer of sheeting as a carrier for letters, numerals and symbols.

4. Where specified, dry film transfer shall be produced digitally using computer-driven Dry Thermal Transfer system over 3M high intensity reflective vinyl substrates.

5. All products specified to employ 3M sheeting, films, or other components shall be guaranteed and backed by 3M MCS Warranty or equivalent.

B. Inks and Paints:

1. All inks and paints shall be a type made for surface material to which it is applied, and recommended by manufacturer. Exact identification shall be noted on shop drawings, with data describing application method, if other than air-drying. Prohibited: paint or ink that will fade, discolor, or delaminate due to UV or heat exposure.

2. All colors for which color match specified shall be approved by Engineer/Architect prior to production.

3. Acceptable manufacturers and suppliers of inks for silk-screening shall be only those materials recommended by the manufacturer of the sheeting and as required for 3M MCS warranty, or equivalent, where applicable.

4. Paints: all materials best quality. Products of DuPont DeNemours & Company, Pittsburgh Plate Glass Company, Glidden, Matthews or Sherwin-Williams acceptable.

a. Opaque background for pressure applied graphics: Two part acrylic polyurethane, low gloss. Care shall be taken to provide proper curing so that outgassing does not occur after application of sheeting and/or graphics.

b. Base for painted graphics on concrete, stucco, masonry and concrete masonry units to be prepared per Paint specifications. Graphics two part acrylic polyurethane, low gloss.

5. Applied color whether ink or paint shall conform to color and accelerated weathering requirements of FP-79 and shall not be removable when tested by Film Adhesion Test and by Film Hardness Test.

C. Blank Panels: Comply with requirements indicated for materials, thickness, finish, color, design, shape, size, and details of construction.

1. General:

a. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 0.0625 in. measured diagonally.

b. The back side and edges of all panel signs shall be painted with acrylic polyurethane, color to match the specified background color.

c. Edge Condition: Square cut.

d. Corner Condition: Square cut for all signs except Regulatory and Warning signs. Regulatory and Warning sign corners shall be rounded per MUTCD.

2. Aluminum:

a. Provide aluminum sheet of 6061-T6 or 5052-H38 alloys and temper recommended by aluminum producer or finisher for use type and finish indicated, and with not less than strength and durability properties specified in ASTM B209 for 5005-H15.

b. Aluminum extrusions shall be of alloy and temper recommended by aluminum producer for type of use and finish and with not less than strength and durability properties specified in ASTM B221 for 6063-T5.

c. Panels shall be etched, degreased, flat, and free of ragged edges. Radius corners by stamping. All signs of same size shall be totally uniform in size. Surface shall be completely clear of dust and dirt before finishes applied.

d. Panels to receive 3M sheeting and/or paint shall be treated with an anodizing conversion coating to provide resistance to corrosion and white rust formation. Conversion coating may be:

1) Chromate, meeting ASTM B449 class 2. Coating weight should be 10 to 35 mg per sq ft with a median of 25 mg per square foot. Coating shall not be dusty and shall be tightly bonded within itself and to the aluminum substrate.

2) Non-chromate coatings must meet the requirements for ASTM B449 class 1 chromate coatings. The non-chrome coating shall be adherent and non-powdery.

Adhesion of air dried acrylic coating shall meet ASTM D 3359 or ASTM D 4541 and must be equivalent to that of the coating on chromate coated aluminum of the same alloy.

e. Fabricate aluminum signs with adequately sized, full-length stiffener members as indicated on Drawings.

Calcium Carbonate <5.0%
Other 5-10%
Melting Point >350 degrees F.

D. V- Signs: Vehicular signs with reflective graphics and retroreflective message on an opaque background.
1. Base materials:
a. Aluminum with either reverse silk screened graphics or pressure-applied retroreflective letters.
2. Graphics and Copy: Any of the following methods of producing graphics and copy may be employed.
a. Pressure applied retroreflective white letters/symbols. Use 3M High Intensity Prismatic White Sheeting 3930.
b. Silk screened; background inks shall be opaque, with retroreflective message.

E. R- Regulatory and W- Warning vehicular signs with retroreflective graphics and message on a retroreflective background.
1. All regulatory and warning signs to fully comply with MUTCD standards.
2. Base material: Aluminum.
3. R and W signs shall have retroreflective messages and retroreflective background using either silk screening or pressure applied retroreflective letters and symbols.
4. Retroreflective colors determined by 23 CFR Appendix to Subpart F of Part 655, Alternate Method to Determining the Color of Retro-reflective Sign Materials and pavement marking materials.
a. Federal Highway Authority (FHWA) Reflective Sheeting Identification Guide using ASTM D 4956-04.
b. Sheeting Types I through IX.
c. The daytime color of non-fluorescent retroreflective materials may be measured in accordance with ASTM Method E 1349, Standard Test Method for Reflectance Factor and Color by Spectrophotometry using Bi-directional Geometry of ASTM Test Method E 1347. Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry.
d. The geometric conditions to be used in both test methods are 0/45 or 45/0 circumferential illumination or viewing. The CIE standard illuminant used in computing the colorimetric coordinates shall be D 65.
e. For fluorescent retroreflective materials ASTM E991 may be used to determine the chromaticity provided that the D65 illumination meets the requirements for E 991.
f. The following 3M Diamond Grade DG^3 Reflective Sheeting materials meet the MUTCD retroreflective requirements:
1) White – DG^{3}4090
2) Red - DG^3 4092
3) Blue – DG^3 4095
4) Yellow - DG^3 4091
5) Green – DG^3 4097
6) Brown – DG^3 4099
7) Fluorescent Yellow – DG^3 4081
8) Fluorescent Yellow Green – DG^3 4083
9) Fluorescent Orange - DG^3 4084

F. PP- Pedestrian Panel Wayfinding and Directional Signs.
1. Base materials:
a. Aluminum with either reverse silk screened graphics or pressure-applied letters.
2. Graphics and Copy: Any of the following methods of producing graphics and copy may be employed:
a. Pressure applied non-reflective letters/symbols.
b. Silk screened over a flat opaque background.

G. PS-Supergraphics, Pedestrian Wayfinding and Directional Signs:
1. Painted Super-Graphics: Where graphics painted directly on walls, doors or other surfaces are specified, message template to be:
a. Pressure applied electronically cut graphics.

2. Apply primer and/or background color as specified on the drawings to surface as required. Sign contractor shall assure that paint employed for graphics is compatible with surface treatment(s) by others, including but not limited to concrete sealers and/or form release agents.

H. PVC- Signs: PVC pipe clearance signs shall have pressure applied decals on black PVC pipe, rectangular retroreflective yellow base sticker 3M Diamond Grade yellow sheeting DG^3 4091 with black border, rounded corners, and black text. See drawings.
1. Electronically cut letters: 3M Scotchlite 3840 reflective sheeting.
2. 10 in. diameter, Schedule 40 PVC pipe, Corrosion Fluid Products Corporation, Addison, IL, or accepted equivalent. Color black.
3. If black PVC is not available, Paint: "Spraylat" Lacryl B No. 482 High Hiding Black. Meet Lacryl system specifications for painting on PVC.

I. VR- Signs: Vandal-resistant signs where specified, shall have copy and graphics on second surface.
1. Base material shall be one of the following:
   a. "Lexan" General Electric Co., or accepted equivalent. Permanently laminate face panels to backing sheets of material and thickness indicated using manufacturer's standard process. Except where digital art is required, signs shall be silk screened on second surface or single sheet.
   b. "Modulite/Moducal" by Pannier Graphics or equivalent fiberglass reinforced plastic (FRP) material. Copy and graphics shall be permanently embedded in fiberglass panel. Resulting sign shall be a solid, one-piece panel with graphic elements inseparable from fiberglass in which they are embedded. Laminated or encapsulated products will not be accepted.
2. Sign shall not be permanently defaced by steam, acids, aromatics, scratching, inks or paints and should be capable of being readily wiped clean with paint remover without affecting appearance or legibility of graphics. Sign shall retain legibility and finished appearance when sprayed with a 10% solution of hydrochloric, nitric or sulfuric acid for one-half hour or when scrubbed by a brush of medium hardness using common commercial cleaning compounds such as ammonia, laundry soaps, detergents, carbon tetrachloride or petroleum based solvents.
3. Sign shall be translucent with a clear or matte finish, as indicated. The index of refraction shall ensure clarity of color, copy and graphics.
4. Sign shall be router cut with sign edges not crazed or cracked and edge finish shall be smooth, neat and clean.
5. Original art and/or multi-colored graphics shall be digitally produced, electronic media.
6. Use colored coatings, including inks and paints for copy and background colors, recommended by manufacturer of sheet for optimum adherence to sheet surface and that are non-fading for application.
7. Fasteners shall be mechanical, concealed and tamper proof.

J. Illuminated Traffic Controller Signs (TC- Signs):
1. Illuminated traffic control signs shall be Signal Tech LED controller or equivalent. Traffic arrows shall be TCL1212 series; open/closed or full messages shall be TCL718 series.
2. Display technology shall be super bright LED using aluminum gallium indium phosphide (ALGaInP) diodes. Viewing angle shall be 70°.
3. Provide for automatic control from PARCS system computer with individual manual override operator control switches located in parking office. In addition, provide additional manual override switches in cashier booth nearest lane controlled.

K. Dynamic Message Signs (DM- Signs):
1. Sign design, construction, fabrication, and assembly shall be sign contractor responsibility, subject to Engineer/Architect's review. Where free-standing, supports shall meet AASHTO Standard Specifications for Highway Signs, Luminaries and Traffic Signals (Latest edition).
2. System to be Daktronics Vanguard VMS or equivalent. Each message line shall be variable and programmable. Display technology shall be LED using aluminum gallium indium phosphide (AlGaInP) diodes. Each digit shall be 7" high, with 7 LED bar segments in amber unless noted otherwise on drawings. The number of characters and/or lines per sign is variable by location, as shown on the drawings.
3. Product shall include all hardware and hardware for Central Control of messages including a computer terminal dedicated thereto. System shall be National Transportation Communications for ITS Protocol (NTCIP) compliant. Control software shall use Windows® NT operating system, with the following features:
   a. User interface configurable for specific sign size (WYSIWYG).
   b. Multiple security password levels.
   c. Message creation & editing capability.
   d. Graphics display capability.
   e. Fonts can be changed and customized to fit client needs.

f. Message preview function.
g. Flexible message library.
h. Message scheduling.
i. Scenario manager.
j. Quick message capability.
k. Real-time message verification.
l. Automatic or manual dimming.
m. Sign status monitoring.
n. VMS system diagnostics (pixels, power supplies, etc.).
o. Controls multiple signs within VMS network.
p. Interfaces with various communication systems (telephone, cellular, fiber, radio, CDPD).
q. Map view user interface.

4. Functional Requirements:
   a. The number of messages per sign required is variable by location, as shown on the drawings.
   b. All messages shall be clearly legible, attracting attention under any lighting condition. At full intensity, sign shall be visible anywhere within 60º cone centered about optic axis.
   c. Where two-way messages are specified, each shall be single or mult-message overlay.
   d. Sign shall completely blank out when not energized. No phantom message shall be visible under any ambient light condition.
   e. Technology shall be solid state, redundant circuitry so that removal or failure of one component has minimal or no effect on overall sign performance.
   f. Signs shall be capable of continuous operation from -35º F to 165º F.

L. Internally Illuminated Signs (I Signs):
1. Sign design, construction fabrication and assembly shall be contractor responsibility, subject to Engineer's review.
2. Aluminum panels, when proposed, to be extruded, anodized aluminum with welded corners and aluminum tube framing as required for straight profiles. Case shall be finished with baked enamel or duranodic in color as shown on the drawings. Illuminated messages, where required, shall be precision cut and filled with translucent material. Illuminated graphics shall be integral and flush with sign face for flat appearance. Raised letters or those projecting beyond sign face will not be accepted.
3. Non-illuminated messages, where specified, shall employ any of the following methods:
   a. Pressure applied non-reflective letters/symbols.
   b. Silk screened.
4. Full message where shown shall be LED letters. Full message shall not be readable when turned off. Full message shall be controlled by PARCS system.
5. No buckling, weaving, or oil canning of face panels.
6. Sign mounting shall be as noted as drawings from among following:
   a. Wall or ceiling mount: Provide mounting channel brackets as required by sign size and location.
   b. Post mount: Sign to be mounted on aluminum posts at both ends, with base plate bolted to concrete foundation to below local frost depth or a minimum of 1/3 the pole height which ever is greater. Coordinate anchor bolt locations with general contractor.
   c. Concrete pedestal mount. Sign to be mounted on concrete pedestal as detailed on drawings. Coordinate anchor bolt, post sleeves and concealed electrical connections with pedestal contractor.
   d. Aluminum pedestal mount: Provide aluminum pedestal cover per drawings. Coordinate anchor bolt, post sleeves and concealed electrical connections with pedestal contractor.
7. All fasteners and brackets shall be non-corrosive.
8. All electrical connections shall be concealed but accessible and serviceable.
9. Interior of cabinet to be primed and painted white with acrylic polyurethane, high gloss finish.
10. Illumination shall be designed by contractor. Incandescent light sources will not be accepted. Each sign shall contain terminal board with adequate wiring. Lamps to be spaced to prevent shadows and hot spots. Uneven illumination will be rejected. Ballast shall be appropriate to temperature ranges at project site. Minimum luminance of sign message shall be 10 cd/m² at night and 30 cd/m² during the day.

M. Fasteners and Supports:
1. Bolts, nylon insert lock nuts: ASTM A 320, Grade B stainless steel.
2. Rivets for signs: ASTM B 316, Alloy 6063-T61 or equivalent. Aluminum alloy blind rivets of self-plugging variety may be substituted for solid aluminum alloy rivets, subject to acceptance by Engineer/Architect.

3. Use concealed fasteners fabricated from metals not corrosive to sign material and mounting surface.
4. Anchors and Inserts: Use nonferrous metal or hot dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
5. Sign posts: ASTM A 499 Grade 60 or ASTM A 576, Grade 1080 and meeting mechanical properties specified in ASTM A 499 for Grade 60 steel.
6. Posts shall be zinc coated per ASTM A 123. Posts shall be straight, with smooth, uniform finish, free from defects affecting strength, durability, or appearance. Punch bolt holes such that post face shall be smooth and even. All holes and ends shall be burr free. After all fabrication, flow coat posts with durable, exterior type, rust inhibiting paint. Paint color: black, unless otherwise indicated on Drawings.
7. Adhesives, where used for wall mounted signs, shall be per the sign material manufacturer's recommendations.
8. For DiBond signs, fasteners and mountings shall follow manufacturer's recommendations. Minimum edge distance of 0.75" or 2.5 times the diameter of the fastener being used is recommended as the distance from the center of the hole to the edge of the panel. Large flat washers shall be used to prevent crushing of the sign material.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION OF SUBSTRATE FOR PAINTED SIGNS

A. Prepare and clean in strict accordance with paint manufacturer's instructions and as specified here, for each substrate condition.
B. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so contaminants from cleaning process will not fall onto wet, newly painted surfaces.
C. Cementitious Surfaces:
   1. Prepare surfaces to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and, by roughening as required, glaze.
   2. Determine alkalinity and moisture content of surfaces to be painted by appropriate testing. If surfaces found to be sufficiently alkaline to cause blistering and burring of finish paint, correct before painting. Do not paint on surfaces with moisture content exceeds manufacturer's limits.
D. Ferrous Metals: Clean uncoated ferrous surfaces of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning. Clean previously coated metals in accordance with manufacturer recommendation.

3.2 MATERIALS PREPARATION FOR PAINTED SIGNS

A. Mix and prepare painting materials per manufacturer's directions.
B. Store materials not in use in tightly covered containers. Keep all containers clean, free of foreign materials and residue.
C. Stir materials before applying to produce uniform mixture, and stir as required during application. Do not stir surface film into material. Remove film and strain material before using if necessary.

3.3 INSTALLATION

A. General: Locate signs where shown using mounting methods of type described and in compliance with manufacturer's instructions. Install sign units level, plumb, and at height shown, with sign surfaces free from appearance defects.
B. For drilled anchors in concrete, verify location of embedded reinforcing steel, post-tensioning, or pre-stressing cables prior to installation.
C. Wall Mounted Panel Signs: Attach to wall surfaces with Hilti "Hit" anchors or ITW Ramset/Red Head Hammer Set anchors into concrete or masonry surfaces as shown on Drawings. DO NOT OVERDRIVE anchors, as overdriven anchors will damage sign faces and spall concrete.
D. Bracket Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs which project at right angles from walls or ceilings. Attach brackets securely to walls or ceilings with concealed fasteners and anchors per manufacturer's directions.
E. Installation of signs shall conform to requirements of Americans with Disabilities Act (ADA) and/or state or local accessibility standards.

3.4 CLEANING AND PROTECTION

A. At completion of installation, clean soiled sign surfaces in accordance with manufacturer's instructions. Protect units from damage until acceptance by Owner.

B. Cleanup: During progress of Work, remove from site all discarded materials and rubbish at end of each day.

C. Upon completion of painting, clean all paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

D. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing. Correct any damage by cleaning, repairing, or replacing, and repainting, as acceptable to Engineer/Architect.

E. Provide "Wet Paint" signs as required.

END OF SECTION

SECTION 10 14 23.16

ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes room-identification signs that are directly attached to the building.
B. Related Requirements:
   1. Section 10 13 00 "Directories" for building directories.

1.3 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
C. Shop Drawings: For room-identification 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, including raised characters and Braille, and layout for each sign at least half size.

D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
1. Include representative Samples of available typestyles and graphic symbols.

E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
1. Room-Identification Signs: Full-size Sample.
2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
3. Exposed Accessories: Full-size Sample of each accessory type.
4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

F. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.11 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. Deterioration of embedded graphic image.
   c. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design," ICC A117.1, and City of Madison Standards.

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign : Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
   1. Conform to City of Madison Standards.

2.3 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings [and suitable for exterior applications].
E. 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.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.
   2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
   3. Exposed Metal-Fastener Components, General:
      a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
      b. Fastener Heads: Use oval countersunk screws and bolts with tamper-resistant Allen-head, spanner-head, or one-way-head slots unless otherwise indicated.
   4. Sign Mounting Fasteners:
      a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
      b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
B. Adhesive: As recommended by sign manufacturer.
C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045-inch-thick, with adhesive on both sides.
D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.
E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
   1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
   2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
   3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
   4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.
C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.
D. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
   1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert.
   2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert.
   3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
B. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.
C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
   1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
   2. Install signs so they do not protrude or obstruct according to the accessibility standard.
   3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
B. Accessibility: Install signs in locations on walls as indicated on Drawings and according to the accessibility standard.
C. Mounting Methods:
   1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
      a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
      b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
   2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
   3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign

is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
6. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.

3.2 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
B. Remove temporary protective coverings and strippable films as signs are installed.
C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION

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SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Abuse-resistant wall coverings.
   2. Floor Sweeper Room walls.
B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for steel angle corner guards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
B. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:
   1. Abuse-Resistant Wall Covering: 6 by 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type of exposed plastic material.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
   1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.

2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

2.3 ABUSE-RESISTANT WALL COVERINGS

A. Abuse-Resistant Sheet Wall Covering: Fabricated from semirigid, plastic sheet wall-covering material.
   1. Basis-of-Design Product: Provide or comparable product by one of the following:
   2. Sheet Thickness: 0.125 inch.
   3. Color and Texture: As selected by Architect from manufacturer's full range.
   4. Height: As indicated.
   5. Trim and Joint Moldings: Extruded rigid plastic that matches wall-covering color.
   6. Mounting: Adhesive.

2.4 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.
B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
C. Adhesive: As recommended by protection-product manufacturer and with a VOC content of 70 g/L or less.

2.5 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

2.6 FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.
B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
B. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.
B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

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SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Public-use washroom accessories.
   2. Under-lavatory guards.
   3. Custodial accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

1.6 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.7 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Bobrick.
   2. Bradley Corp.
   3. ASI.
   4. World Dryer (for electric hand dryers).
   5. Excel Dryer (for electric hand dryers).
   6. Dyson B2B Inc. (for electric hand dryers).

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inchminimum nominal thickness unless otherwise indicated.
B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inchminimum nominal thickness.
C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60hot-dip zinc coating.
D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser (TTD-1):
   1. Basis-of-Design Product: Bobrick B-2888.
   2. Description: Satin-finish stainless steel unit with stainless steel dispensing mechanism. Door has flat face with protruding tumbler lock. Holds two rolls up to 5-1⁄4inches (135 mm) diameter (1800 sheets). Extra roll automatically drops in place when bottom roll is depleted. Theft-resistant, heavy-duty spindles. Unit 6-1⁄16 inches W, 11 inches H, 5-15⁄16 inches D (155 x 280 x 150mm).
   2.
C. Grab Bar (GB-1):
   1. Basis-of-Design Product: Bobrick B-5806.

2. Description: 1-1/4 inches (3 2mm) diameter tubing. Constructed of 18-gauge (1.2 mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8 inch (3 mm) thick, type 304 stainless steel plate, 2 inches W x 3-1/8 inches H (50 x 80 mm), with screw holes for concealed anchors. Cover is 22-gauge (0.8 mm), type 304 stainless steel with satin finish, 3-1/4 inches (85 mm) diameter. Cover snaps over mounting flange to conceal screws.
3. Configuration and Length:
   a. GB-1A: 36 inches (914 mm) horizontal grab bar.
   b. GB-1B: 42 inches (1067 mm) horizontal grab bar.
   c. GB-1C: 18 inches (457 mm) vertical grab bar.
   d. GA-3: 24 inches vertical grab bar.

D. Sanitary-1 Napkin Disposal Unit (HU-1):
1. Basis-of-Design Product: Bobrick B-270.
2. Description: Satin-finish stainless steel. Cover is drawn, one-piece construction; secured to cabinet with full-length stainless steel piano-hinge. Capacity: 1.0-gallon (3.8-L). Unit 7-1/2 inches W, 10 inches H, 3-13/16 inches D (190 x 255 x 95 mm).

E. Mirror Unit (MU-1):
1. Basis-of-Design Product: Bobrick B-294.
2. Description: Tilt forward to provide full visibility for wheelchair patients or return to upright position. Frame is 3/4-inch x 3/4 inch (19 x 19 mm), type 304 stainless steel angle, satin finish. Beveled edges of frame; provides gapless fit for improved appearance, and safety when cleaning mirror. No. 1 quality, 1/4-inch (6 mm) glass mirror; warranted against silver spoilage for 15 years. Top of mirror tilts 7 inches (180 mm) from wall with self-locking mechanisms; bottom of mirror mounts to wall with full-length stainless steel hinge.
3. Size: 18 inches (457 mm) W x 30 inches (762 mm) D.

F. Mirror Unit (MU-2)
1. Basis-of-Design: Bobrick B-290.
2. Description: One-piece, roll-formed 3/4" x 3/4" (19 x 19mm) angle-frame. Type 304 stainless steel angle with satin finish. Corners heliarc welded, ground and polished smooth. Beveled frame edge at mirror for improved appearance. No. 1 quality, 1/4" (6mm) glass mirror; warranted against silver spoilage for 15 years. Galvanized steel back. Secured to concealed wall hanger with theft-resistant mounting.
3. Size: 24-inches W x 72-inches H (61 x 183cm).

G. Reversible Folding Shower Seat (SS-1)
1. Basis-of-Design Product: Bobrick B-5181.
2. Description: Constructed of durable, water-resistant, ivory-colored 1/2-inch (13mm) thick solid phenolic. Reversible for left- or right-hand field installation. Frame and mounting brackets are type 304 stainless steel with self-locking mechanism. Supports up to 360 lbs (163 kg) when properly installed.
3. Size: Seat 33-inch (840mm) wide, projects 22-5/16-inch (565mm) from wall.

H. Shower Curtain Rod with Concealed Mounting (SCR-1)
1. Basis-of-Design: Bobrick B-207 x ___
2. Description: 1-inch (25mm) diameter rod is 20-gauge (1.0mm), type 304 stainless steel, satin finish. 1 3/8-inch (35mm) diameter flanges are chrome-plated plastic, bright-polished finish; mount on concealed wall brackets.
3. Size: Sized to fit shower openings.

I. Electric Hand Dryer (HU-3)
1. Basis-of-Design: Bobrick B-7120.
2. Description: Durable, 22-gauge, zinc-plated steel with white epoxy cover with black plastic trim, automatic operation, dual air outlets.
3. Mounting: Surface mounted.
4. Depth: 4-inches maximum depth from mounting wall.
5. Power: 115V AC, 15 Amp, 50/60 Hz, 1725 Watts, Single Phase, UL-Listed.

J. Soap Dispenser (SD-1)
1. Basis-of-Design: Bobrick B-2112.
2. Description: Horizontal tank is satin-finish stainless steel. Valve dispenses all-purpose hand soaps. Capacity: 40-fl oz (1.2-L). Soap refill window. Concealed wall fastening. Hinged filler-top requires special key to open. Vandal-resistant.
3. Size: Unit 8 1/8-inch W, 4 3/4-inch H (205 x 120mm); wall to push-button, 3 1/2-inch (90mm).

K. Robe Hook (RH-1)

1. Basis-of-Design: Kohler K-14443-CP.
2. Description: Solid-brass construction for durability. Finishes resist corrosion and tarnish. Coordinates with other products in the Purist Collection.
3. Size: 1-3/4-inch L x 1-7/8-inch H x 1-7/8-inch W.

L. Bench (B-1)
1. Basis-of-Design: Global Industrial WB269864TN
2. Description: ADA compliant locker room bench wall mount bracket is made of 1-1/2-inch W x 1/8-inch H steel bracket with reversible design. 3-inch x 3-inch notch for a wall cleat or wire run clearance. The bracket gets attached directly to a wall, so the wall acts as a back rest for conform to ADA Standards.
3. Size: 24-inch W x 42-inch L.

2.4 UNDER-LAVATORY GUARDS

A. Under-lavatory Guard:
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. Truebro by IPS Corporation.
   b. Plumberex Specialty Products, Inc.
   c. Buckaroos, Inc.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.5 CUSTODIAL ACCESSORIES

2.

B. Utility Shelf (US-2):
1. Basis-of-Design Product: Bobrick 295 x 16.
2. Description: Shelf is 18-gauge (1.2mm), type 304 stainless steel, satin finish. 3⁄4-inch (19mm) return edge; front edge is hemmed for safety. Brackets are 16-gauge (1.6mm). Three stainless steel rag hooks. Rod for wet rags below shelf.
3. Size: 16-ich (405mm) long x 5-inch (125mm) wide.

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion resistant backing plates.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
B. Remove temporary labels and protective coatings.
C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 10 51 00
METAL LOCKERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Lockers of the following types:
   1. Heavy duty metal lockers.
   2. Locker accessories.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.
B. Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

A. ADAAG - American with Disabilities Act, Accessibility Guidelines.
B. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
C. ASTM International (ASTM):
   1. ASTM A 1008 - Standard Specification for Steel Sheet, Carbon, Cold-Rolled, Commercial Quality.
   2. ASTM D 4976 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
   3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Provide layout and elevations of lockers with overall dimensions.
D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms.
E. Verification Samples: For finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product and color selected.

1.5 QUALITY ASSURANCE

A. Provide all lockers from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inspect lockers upon receipt for visible damage. Further inspection if necessary for hidden damage.
B. Store products in manufacturer's unopened packaging until ready for installation.
C. Sequence deliveries to avoid project delays, but minimize on-site storage.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. ASI Storage Solutions; 900 Clary Connector, Eastanollee, GA. Tel: 706-827-2720; Fax: 706-827-2710; Email:request info (info@asi-storage.com); Web: http://asi-storage.com.
B. Salsbury Industries; 1010 East 62nd Street, Los Angeles, CA. Tel: 800-624-5269; Fax: 800-624-5299; Website: www.mailboxes.com.
C. Hadrian Manufacturing; 7420 Clover Avenue, Mentor, OH. Tel: 440-942-9118; Fax: 800-536-1469; Website: www.hadrian-inc.com.
D. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

2.2 MATERIALS

A. Steel: Prime grade mild cold-rolled sheet steel free from surface imperfection, capable of taking a powder coating finish.
   1. Hooks: Zinc plated forged steel, ball ends.
   2. Bolts and Nuts: Zinc plated truss fin head bolts, hex nuts.
   3. Rivets.

2.3 HEAVY-DUTY METAL LOCKERS

A. Material: Steel parts shall be mild cold tolled commercial quality steel, ASTM A1008.
B. Finish: Steel surfaces shall be power washed, phosphate treated and finished with an electrostatically applied 2 mm thick hybrid epoxy/polyester powder coating and baked.
C. Construction: Lockers shall be built on a unitized principle with common intermediate uprights separating units.
D. Door Frames: 16-gauge formed in a channel shape. Vertical members shall have additional flange to provide a continuous door strike. Cross frame members; 16-gauge channel shaped
   1. Double Tier Lockers: Include intermediate cross frames.
   2. Triple Tier Lockers: Include intermediate cross frames.
E. Doors: 14-gauge, channel shaped on both the lock and hinge side, with angle formations across the top and bottom. Locker doors shall have 16-gauge full height reinforcement channel in the door edges.
F. Body:
   1. Bottoms: 16-gauge.
   2. Tops, Sides, Backs and Shelves, Knocked Down: 24-gauge.
   3. Tops, Sides, Backs and Shelves, Welded: 18-gauge.
   4. Bolt spacing shall not exceed 9 inches (228 mm) o.c.
G. Ventilation: Locker sides and doors 20 inches (508 mm) or higher shall be perforated with diamond-shaped openings 3/4 inch (19 mm) wide by 1-1/2 inches (38 mm) high in a quantity and pattern to ensure maximum ventilation and maintain structural strength. Doors less than 20 inches (508 mm) high shall have small diamond-shaped perforations 7/16 inch (11 mm) wide by 15/16 inch (24 mm) high.
H. Hinges: Full length 16-gauge continuous piano type, riveted to both door and frame.
I. Handles: One-piece 20 gauge deep drawn stainless steel cup designed to accommodate locks.

J. Latching: An 11-gauge frame hook shall be secured to the fame. The frame shall have a padlock hasp protruding through the recessed handle. A rubber silencer shall be firmly secured to the frame at each latch hook.
K. Interior Equipment:
   1. Single tier lockers 48 inches (1.219 m) or higher shall have a shelf.
   2. Single tier lockers less than 18 inches (457 mm) deep shall have three wall hooks and one ceiling hook.
   3. Single tier lockers 18 inches (457 mm) deep or more shall have a coat rod instead of a ceiling hook.
   4. Double Tier lockers shall have three wall hooks and one ceiling hook
   5. Triple Tier lockers shall have three wall hooks for 12 inches (305 mm) wide lockers.
   6. Triple tier lockers shall have four wall hooks for 15 inches (381 mm) and wider lockers.
L. Number Plates: Each locker shall have a polished aluminum number plate riveted to door face with black numerals 1/2 inch (12 mm) high.
M. Finish: Baked on powder coat finish in one manufacturer's standard color.
N. Assembly: All locker components shall be assembled with rivets.

2.4 LOCKER ACCESSORIES

A. Metal Locker Sloped Tops:
   1. Continuous slope top shall be 18-gauge sheet steel, powder coated to match the color of the lockers. Hoods are 72 inches (1.828 m) in length by depth of locker. For longer lengths, slip joints without visible fasteners at splice locations shall be provided. End closures shall be provided. The slope shall have a rise equal to 1/3 of the locker depth, plus a 1 inch (25 mm) vertical rise at the front.
   2. Individual sloped tops shall be 24-gauge sheet steel, powder coated to match the color of the lockers. Tops shall be formed to a slope which rises 1/3 of the locker depth.
B. Metal Locker Bases:
   1. Base: Zee base shall be 14-gauge sheet steel, powder coated to match the color of the lockers.
   2. Base: Front base/closed end base shall be 18-gauge sheet steel, powder coated to match the color of the lockers. Front bases shall be installed between the front legs without overlap or exposes fasteners. End bases shall be installed between front and rear legs of lockers at end of a row.
C. Metal Locker Fillers-Vertical: Fillers shall be 20-gauge sheet steel, powder coated to match the color of the lockers.
   1. Filler Width: 6 inches (152 mm).
   2. Filler Width: 12 inches (305 mm).
D. Metal Locker Recess Trim: Recess trim shall be 18-gauge sheet steel, powder coated to match the color of the lockers.
   1. Side Trim (Trim is handed):
      a. 3 inches (76 mm) wide by 63 inches (1.60 m) high.
      b. 3 inches (76 mm) wide by 75 inches (1.90 m) high.
   2. Top Trim: 74 inches (1.88 m) long by 3 inches (76 mm) high
   3. Splice: 2 inches (50 mm) by 3 inches (76 mm).

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

A. Install lockers and accessories at locations shown in accordance with manufacturer's instructions.
B. Install lockers level and plumb with flush surfaces and rigid attachment to anchoring surfaces.
C. Anchor lockers to floor and wall at 48 inches (1.219 m) or less, as recommended by the manufacturer.
D. Fasten adjoining locker units together to provide rigid installation.

E. Install sloping tops and metal fillers using concealed fasteners. Provide flush hairline joints against adjacent surfaces.
F. Install front bases between legs without overlap or exposed fasteners. Provide end bases on exposed ends.
G. Install benches by fastening bench tops to pedestals and securely anchoring to the floor using appropriate anchors for the floor material.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.
B. Touch-up factory-finish and repair or replace damaged products before Substantial Completion.

3.4 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION

SECTION 10 51 13

LOCKERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Plastic laminate clad lockers.
   2. Locker benches.

1.3 ACTION SUBMITTALS

A. Product data.
B. Sustainable Design Submittals:
   1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
   2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: Include plans, elevations, sections, details, attachments to other work, and locker identification system and numbering sequence.
D. Samples: For each color specified.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 PLASTIC LAMINATE LOCKERS

A. Manufacturers:
   1. Basis of Design: Hollman Inc., 1825 Walnut Hill Lane, Irving, TX 75038; Tel: (800) 433-3630; Website: www.hollman.com.
   2. Salsbury Industries Inc., 1010 East 62nd Street, Los Angeles, CA 90001; Tel: (800) 624-5269; Website: www.lockers.com.
   3. Wenger Corporation, 555 Park Drive, Owatonna, MN 55060; Tel: (800) 493-6437; Website: www.wegnercorp.com.
   4. Other manufacturers as approved by Architect.

B. Materials:
   1. Locker Frame: Tops, sides, and back shall be constructed of 5/8-inch-high density thermo-fused melamine.
      a. Expansion / contraction within +/- 1/16 inch per locker.
   2. Available Locker Models: Refer to Drawings.
      a. Single tier, Model A: 1-Top Shelf, 1-Coat Rod, 1-Coat Hook
      b. Double tier, Model B: 1-Coat Rod, 1-Coat Hook
   3. Visible Edges: Sealed with a 1.5-millimeter PVC edge banding to closely match locker doors
   4. Locker Doors:
      a. Laminate: 5/8-inch-high-industrial grade particle board core with 0.030-inch vertical grade high pressure Class II-B fire retardant plastic laminate.
         i. Matching laminate applied to interior & exterior door face.
         ii. Door edges sealed with eased edge 1.5 mm PVC edge banding to closely match laminate.
   5. Standard hardware:
      a. Number disk, 1-1/2 inches diameter flush mounted disc with 3/8-inch-high contrast digits. US Block 1L font.
      b. Coat Rod, 1-inch diameter recessed rod.
      c. Coat Hook(s), 2-prong metal hooks.
      d. Hinges shall be nickel finished, concealed, heavy duty European steel allowing 110-degree door opening with a limited lifetime warranty.
         i. 4 hinges per door 60 inches high and over.
         ii. 3 hinges per door 36 inches to 59 inches high.
         iii. 2 hinges per door 35 inches high and under.
   6. Locks: Centered vertically in door & spaced horizontally per lock type.
   7. Venting: 12-millimeter openings between door and top and bottom of locker and dividers on multiple opening frames provide continuous natural air flow.

C. Fabrication:
   1. Locker shall be fabricated using doweled and glued & nailed assembly process.
   2. Fabricate lockers square, rigid and without warp, with the finished faces flat and free of scratches and chips.
   3. Machine all parts and attachment holes accurately and without chips.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
   1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
   2. Anchor single rows of metal lockers to walls near top.
   3. Anchor back-to-back metal lockers to floor.

B. Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
   1. Attach recess trim to recessed metal lockers with concealed clips.
   2. Attach filler panels with concealed fasteners.

3. Attach sloping-top units to metal lockers, with closures at exposed ends.

D. Fixed Locker Benches: Provide benches in material and quantity as indicated on the Drawings.

END OF SECTION

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SECTION 10 56 00
SHELVING AND CLOSET HARDWARE

PART 1 – GENERAL

1.1 SUMMARY

A. Closet hardware and accessories.

1.2 REFERENCES

A. ANSI/BHMA A156.9, American National Standard for Cabinet Hardware.

1.3 DESIGN / PERFORMANCE REQUIREMENTS

A. Shelf standards and brackets meet or exceed the ANSI performance standards as established by ANSI/BHMA A156.9.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 23 - Submittals.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.6 WARRANTY

A. Provide manufacturer's limited lifetime warranty.
B. See Section 01 60 00 - Product Requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Knape & Vogt Mfg. Co., which is located at: 2700 Oak Industrial Dr. N.E. ; Grand Rapids, MI 49505-6083; Toll Free Tel: 800-253-1561; Tel: 616-459-3311; Fax: 616-459-0249; Email: request info (susan.hughes@kv.com); Web: www.kv.com.

B. ClosetMaid Corporation, 650 S.W. 27th Avenue, Ocala, FL 34471; Tel: (800) 221-0641; Website: www.closetmaidpro.com.

C. Hafele America Company, 3901 Cheyenne Drive, P.O. Box 4000, Archdale, NC 27263; Tel: (888) 437-7477; Website: www.hafele.com.

D. Requests for substitutions will be considered in accordance with provisions of Section 01 25 13 - Product Substitution Procedures.

2.2 SHELVING SYSTEMS

A. Heavy Duty Shelf Standards and Brackets:

1. Shelf Standard Components: Heavy-Duty 83 Standard single-slotted channel wall standards. Standards mounted to a suitable wall surface with mounting hardware 16 inches (406 mm) o.c. is capable of supporting 285 to 480 pounds per pair of standards when properly installed.
    a. Face: 3/4 inch (19 mm) wide by 1/2 inch (12 mm) deep, single slotted.
    b. Material:
        i. Material and Finish: Steel, Anochrome, electro zinc-plated, clear lacquer, ROHS compliant.
    c. Lengths: As required to support shelving indicated.
2. Shelf Bracket Components: Steel, reinforced, locking into slots; size to suit shelves. Brackets adjustable in 1 inch (25.4 mm) increments along entire length of standard, drilled and countersunk for screws.
    a. Right Flanged Shelf Brackets: Model 183R: Double tab type with flange for quickly attaching wood shelves to brackets, locking into slots; size to suit shelves; same finish as standards; use for installing RIGHT side of shelf; keyhole mounting holes for easy installation of shelves.
    b. Left Flanged Shelf Brackets: Model 183L: Double tab type with flange for quickly attaching wood shelves to brackets, locking into slots; size to suit shelves; same finish as standards; use for installing LEFT side of shelf; keyhole mounting holes for easy installation of shelves.
    c. Center Flanged Shelf Brackets: Model 183C: Double tab type with flange for quickly attaching wood shelves to brackets, locking into slots; size to suit shelves; same finish as standards; use for joining two shelves together; keyhole mounting holes for easy installation of shelves.
3. Shelving:
    a. Shelving: As indicated on Drawings.
4. Shelf Rests: Model 106: Provide where shelves are indicated to join at shelf bracket.

2.3 SHELF BOARDS

A. Heavy Duty All Purpose Shelf Boards: Heavy-Duty 1980 All Purpose Shelf Boards consist of 5/8 inch (16 mm) thick shelf board with square corners for storage and display needs.

1. Performance: Supports up to 200 pounds when properly installed
2. Finish and Sizes:
    a. White;
        i. Size as indicated on the Drawings.

2.4 ACCESSORIES

A. Closet Rods: Commercial grade steel; long-lasting, corrosion resistant finish. Meets and/or exceeds ANSI/BHMA weight load requirements.

1. Round Closet Rod Tubing, Outside Diameter: 1-1/16 inches (27 mm):
    a. Model 750 1: 2.0 mm wall thickness; inside diameter: 29/32 inch (23 mm);
        i. Finish: Brilliant Chrome; premium double-plated finish, seamless, pit-free.
        ii. Length as indicated on the Drawings.

B. Closet Rod Flanges: Flanges of commercial grade steel; long-lasting, corrosion resistant finish. Meets and/or exceeds ANSI/BHMA weight load requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare components to receive hardware using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Mount standards to solid backing capable of supporting intended loads. Install standards using fasteners suitable for supporting intended loads.
C. Install brackets as indicated on the Drawings.
D. Install shelving, and accessories as indicated on the Drawings.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 11 12 00
PARKING CONTROL EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

B. The Work of this Section shall be provided by the City of Madison under separate contract. Contract Document references and incorporated information are for coordination and service/rough-in contract requirements only.

1.2 SUMMARY

A. Section Includes:
   1. Automatic barrier gates.
   2. Vehicle detectors.
   3. Traffic controllers.
   4. Entry terminal ticket dispensers.
   5. Exit terminals.
   6. Pay stations.
   7. Fee computers.
   8. Miscellaneous parking control equipment.
   9. Parking facility management software.
   10. Access control units.

B. Related Requirements:
   1. Section 05 50 00 "Metal Fabrications" for pipe bollards to protect parking control equipment.

1.3 PRE-INSTALLATION MEETINGS

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

1. Inspect and discuss electrical roughing-in, empty low voltage conduit and raceways, equipment bases, and other preparatory work provided by base building construction contract. Verify that equipment operation is consistent with system description.
2. Review sequence of operation for each type of parking control equipment.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.

1.4 ACTION SUBMITTALS (PROVIDED BY CITY OF MADISON)

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for parking control equipment.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties.

B. Shop Drawings: For parking control equipment.
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include diagrams for power, signal, and control wiring.
   4. Vehicle Detectors: Layout and method of placement of vehicle loop detector system.

1.5 INFORMATIONAL SUBMITTALS (PROVIDED BY CITY OF MADISON)

A. Coordination Drawings: Plans, details, and diagrams, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For parking control equipment to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Gate Arms: Two breakaway gate arms for each gate installed, complete with accessory components.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain parking control equipment from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

A. Refer to Equipment Schedule.

2.3 ANCHORAGES

A. Anchor bolts; hot-dip galvanized according to ASTM A 153/A 153M and ASTM F 2329.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including equipment bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before parking control equipment installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install parking control equipment as required for complete and integrated installation.
   1. Rough-in electrical connections provided by base building contract.
B. Automatic Barrier Gates: Anchor cabinets to concrete bases with anchor bolts or expansion anchors, and mount barrier gate arms.
   1. Install barrier gates according to UL 325.
C. Vehicle Loop Detectors: Cut grooves in pavement and bury and seal wire loop at locations indicated on Drawings according to manufacturer's written instructions. Connect to parking control equipment operated by detector.
D. Traffic Controllers: Anchor controllers to recessed concrete bases with anchor bolts or expansion anchors.
E. Entry Terminal Ticket Dispensers, Pay Stations and Exit Terminals: Attach cabinets to concrete bases with anchor bolts or expansion anchors.
   1. Connect equipment to remote computer.
   2. Load ticket dispenser with supply of tickets.
F. Fee Computers: Install computers at locations indicated, including connecting to peripheral equipment and remote computers.
G. Connect wiring.
H. Ground equipment.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
C. Perform the following tests and inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Parking control equipment will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust parking control equipment to function smoothly, and lubricate as recommended by manufacturer.
B. Confirm that locks engage accurately and securely without forcing or binding.
C. After completing installation of exposed, factory-finished parking control equipment, inspect exposed finishes and repair damaged finishes.

3.5 PROTECTION

A. Remove barrier gate arms during the construction period to prevent damage, and install them immediately before Substantial Completion.

3.6 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain parking control equipment.

3.8 PARKING CONTROL EQUIPMENT SCHEDULE

A. Parking Access and Revenue Control System (PARCS)

1. A parking access and revenue control system (PARCS) will be provided in the parking structure. The City of Madison will procure the PARCS directly from HUB who will place their equipment on the project. All electrical and communication work associated with the PARCS is part of this project. We have assumed the following PARCS will be used at each of the entrance and exit locations:

B. Level 1 Plan (Wilson Street):

Entrance Lane Equipment:

1. One parking gate
2. Three detector loops
3. One counter system
4. One proximity card reader (incorporated into entrance station)
5. One entrance station (ticket dispenser)
6. One lot full sign
7. One intercom

Reversible Lane Equipment:

8. Two parking gates
9. Six detector loops
10. Two counter systems
11. Two proximity card readers (incorporated into entrance/exit stations)
12. One entrance station (ticket dispenser)
13. One pay-in-lane machine (cash, credit, validations)
14. One lot full sign
15. Two intercoms

Exit Lane Equipment:

16. One parking gate
17. Three detector loops
18. One counter system
19. One proximity card reader (incorporated into exit station)
20. One pay-in-lane machine (cash, credit, validations)
21. One intercom

Wilson Street Elevator Lobby:

22. One pay-on-foot machine (cash, credit)
23. One pay-on-foot machine (credit card only)
24. One future pay-on-foot machine

C. Level 2 Plan (Doty Street)

Top of Reversible Ramp:

1. One parking gate
2. Two detector loops

Bottom of Reversible Ramp

Reversible Lane Equipment:

3. Two parking gates
4. Six detector loops
5. Two counter systems
6. Two proximity card readers (incorporated into entrance/exit stations).
7. One entrance station (ticket dispenser)
8. One pay-in-lane machine (cash, credit, validations)
9. Two intercoms

Doty Street Elevator Lobby:

10. One pay-on-foot machine (cash, credit)
11. One pay-on-foot machine (credit card only)
12. One future pay-on-foot machine

D. Level U2 Plan (City of Madison Parking)

Entrance Lane Equipment:

1. One parking gate
2. Three detector system
3. One counter system
4. One proximity card reader
5. One intercom

Exit Lane Equipment:

6. One parking gate
7. Three detector loops
8. One counter system
9. One proximity card reader
10. One intercom

General

11. Traffic controllers located above all lanes
12. One fee computer and work station in office

END OF SECTION

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SECTION 11 31 00
APPLIANCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Cooking appliances.
   2. Refrigeration appliances.
   3. Cleaning appliances.

1.3 PRE-INSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Sustainable Design Submittals:
   1. Product Data: For indicated products, indicating compliance with requirements for ENERGY STAR product labeling.
C. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Product certificates.
B. Field quality-control reports.
C. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 WARRANTY

A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Gas-Fueled Appliances: Certified by a qualified testing agency for each type of gas-fueled appliance according to ANSI Z21 Series standards.
C. Appliances: Refer to Material Equipment List.
D. Requests for substitutions will be considered in accordance with provisions of Section 012513 - Product Substitution Procedures.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance performance parameters.
   2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After installation, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
B. An appliance will be considered defective if it does not pass tests and inspections.
C. Prepare test and inspection reports.

END OF SECTION

SECTION 12 36 61
SIMULATED STONE COUNTERTOPS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Solid-surface-material countertops and backsplashes.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.
B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and pre-consumer recycled content and cost.
   2. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
   3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
   4. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
   5. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
D. Samples: For each type of material exposed to view.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but 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-MATERIAL COUNTERTOPS

A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
   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. E. I. du Pont de Nemours and Company.
      b. Formica Corporation.
      c. LG Chemical, Ltd.
      d. Silestone by Cosentino.
      e. Wilsonart International.
   2. Colors and Patterns: As selected by Architect from manufacturer's full range.

B. Configuration: Provide countertops with the following front and backsplash style:
   1. Front: Straight, slightly eased at top.
   2. Backsplash: Straight, slightly eased at corner.
   3. Endsplash: Matching backsplash.

C. Countertops: 1/2-inch-with front edge built up with same material].

D. Backsplashes: 1/2-inch-thick, solid surface material.

2.2 COUNTERTOP MATERIALS

A. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION

SECTION 12 93 00
BICYCLE RACKS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes bicycle racks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: To show the dimensions of the assemblies and attachment methods to the anticipated substrates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 – PRODUCTS

2.1 BICYCLE RACKS

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. Ground Control Systems, 708 Alhambra Blvd., Sacramento, CA 95816; Tel: (800) 630-7225; Website: www.groundcontrolsystems.com.
      a. Comparable product to comply with Madison Zoning requirements for temporary bike racks -- each space 2 feet 6 inches wide by 6 feet deep.
   2. Saris Cycling Group Inc., 5253 Verona Road, Madison, WI 53711; Tel: (800) 783-7257; Website: www.bikefixation.com.
   3. Madrax by Graber Manufacturing Inc., 1080 Uniek Drive, Waunakee, WI 53597; Tel: (800) 448-7931; Website: www.madrax.com.
   4. Substitutions will be considered under the provisions of Section 012513 – Product Substitution Procedures.

2.2 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

SECTION 12 93 10
BICYCLE STORAGE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes bicycle racks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Saris Cycling Group; 5253 Verona Rd., Madison, WI 53711. ASD. Toll Free TEL: (800) 783-7257. Tel: (608) 274-6550. Fax: (608) 274-1702. Email: prkmgr@saris.com Web: http://www.sarisparking.com.

B. Graber Manufacturing Inc., 1080 Uniek Drive, Waunakee, WI 53597; Tel: (800) 448-7931; Website: www.madrax.com.

C. Ground Control Systems, 708 Alhambra Blvd., Sacramento, CA 95816; Tel: (800) 630-7225; Website: www.groundcontrolsystems.com.

D. Requests for substitutions will be considered in accordance with provisions of Section 012513 – Product Substitution Procedures.

2.2 BICYCLE HIGH SECURITY RACKS

A. Bicycle High Security Racks, City Rack 2400 Series (Basis of Design):

1. Construction: 7-gauge, 2.5 inches (63 mm) square steel tube frame; 11-gauge, 1-1/2 inches by 1 inches (38 mm by 25 mm) square tube hangers.

2. Capacity: refer to Drawings.
3. Finish: Polyester powder coat.
4. Color: To be selected by Architect from manufacturer's standard color line.

2.3 BICYCLE STORAGE RACKS

A. Locking Bike Rack (Basis of Design): "Bike Tracs" vertical no. 6006.
   1. Locking vertical single bike rack.
   2. Finish: Polyester powder coat.
   3. Color: Black.

2.4 MATERIALS

A. Steel Tube: ASTM A 513, electric welded steel tubing.
B. Steel Pipe: ASTM A 500B steel pipe.

2.5 IRON FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

SECTION 14 20 50
GENERAL ELEVATOR REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Comply with the Conditions of the Contract, including General and Supplementary Conditions, and Division 1 Specification.
B. Provide 4 basement geared traction elevators as specified herein and as shown on Drawings.
C. This section applies to Section 14 21 00 Traction Elevators.

1.2 RELATED WORK

A. Power of necessary characteristics during erection of elevators to provide illumination, operation of required tools, hoists and power for starting, testing and adjusting elevators.
B. Machine room heating and cooling sufficient to maintain temperature between 60 and 80 degrees F.
C. Machine room door for each group of elevators. Doors shall be fire rated, self-closing and self-locking and a minimum of 3'-0" wide by 7'-0" high and shall swing outwards.
D. Smoke detectors in machine rooms and elevator lobbies. Three dry contacts in each machine room – one contact shall indicate activation of ground floor smoke detector; one contact shall indicate activation of machine room smoke detector and third contact shall indicate activation of typical floor smoke detector.
E. Telephone lines to each machine room for two-way communication to each elevator.
F. Patching of lobby walls to accommodate entrances and hall buttons.

G. Sump pit, sump pump and grating in each elevator group (total of 2). Pit floors shall be sloped so water will run off into sump pits.
H. Finished flooring in elevators.
I. Pit ladder in pit of each elevator (total of 4). Pit ladder shall be located as directed by elevator contractor and shall extend at least 4'-0" above bottom landing.
J. Pit light switches located at top of each pit ladder.
K. Machine room lighting consisting of 4'-0" long double tube guarded LED light fixtures providing a minimum illumination of 20 foot candles.
L. Machine room light switches located beside strike jamb of each access door.
M. Hoistway lighting at top of hoistways consisting of 4'-0" long double tube guarded LED light fixtures providing a minimum illumination of 20 foot candles.
N. Hoistway lighting switch located in hoistway adjacent to top landing of each elevator.
O. Three phase, four wire feeder and fused and lockable mainline disconnect for each elevator. Disconnect shall be located in machine room within sight of respective controller.
P. Two single phase, three wire, 20 amp feeders and fused and lockable disconnects for cab lighting and CCTV cameras and LCD monitors of each elevator. Disconnects shall be located in respective machine room.
Q. Fire rated machine rooms and hoistways. Hoistways shall be plumb within +/- one inch. Ledges projecting more than 4 inches inside hoistways shall be beveled at an angle of 75 degrees to the horizontal.
R. Structural supports in hoistways to support car and counterweight guide rails for each elevator and structural supports at top of hoistway to support machine beams provided by elevator contractor.
S. Structural supports in pits to accommodate car and counterweight buffer reactions.
T. Cameras in each elevator as required.
U. Two-inch diameter conduit between elevator control panel in Fire Command Center and each group of elevators.
V. IN CASE OF FIRE signage beside each hall button fixture.
W. Standby generator capable of operating one elevator from each group (total of 2) at a time.
X. Two dry contacts in each machine room – one contact shall indicate that building is operating on standby power and 2nd contact shall indicate change in power source (normal to standby or standby to normal) at least 20 seconds prior to change in power.

1.3 QUALITY ASSURANCE

A. Work in this section shall be subject to all applicable provisions of state and local building and safety codes and any other codes referenced herein.
B. Except for more stringent requirements as indicated or imposed 1 by governing regulations, all work and tests shall conform to Wisconsin Building Code and American Society of Mechanical Engineers Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks ASME A17.1 latest edition.
C. References in this Specification to Electrical Code are to National Electrical Code latest edition.
D. Comply with Americans with Disabilities Act, Illinois Accessibility Code and ANSI A117.1 for designing for the physically disabled.
E. Obtain and pay for necessary building permit, inspection and operating permits and make such tests as called for by regulation of such authorities. Tests shall be made in presence of authorized representatives of such authorities.
F. Use only components which are known to perform satisfactorily under expected use. Upon Owner's request, provide reference of similar installation.

1.4 SUBMITTALS

A. Submit information regarding power requirements (starting and running currents), heat dissipation rates, access requirements and lighting and outlet locations, within two weeks subsequent to Contract Award.
B. Submit completion schedule showing equipment delivery dates and anticipated completion date for each elevator, including final group adjustment dates, within two weeks subsequent to Contract Award. Dates are to coincide with Construction Progress Schedule.
C. Submit (6) six 12" x 12" samples of 12" lengths of materials and finishes for review which will be exposed to public view before fabrication. Samples shall fully represent physical and chemical properties of materials to be supplied.
D. Submit all certification and proof of required fire endurance ratings by acceptable testing organization or evidence of UL label and testing for parts where required.
E. Submit three sets of shop and erection drawings. Include layouts of different levels, machine rooms, power and heat release data, loads transmitted to structure, machine room equipment isolation details, extended car frame details, cab design, details of entrances, signals, fixtures and panels.

F. Upon completion of work, submit three sets of record wiring diagrams to Owner (for subsequent review and submittal to Owner) including all field wiring changes. Also provide complete maintenance and operating manuals, as specified herein, sufficiently detailed to allow the Owner to undertake maintenance of equipment in future.

1.5 WARRANTY

A. Elevator Contractor shall warrant that materials and workmanship or apparatus installed are in accordance with Contract Document requirements, and that he will make good any defects not due to ordinary wear and tear or improper use, which may develop within one year from date of Substantial Completion.

B. In event that equipment does not meet all requirements of Specifications, Elevator Contractor shall promptly remove from premises Work failing to comply and promptly replace or re-execute Work without expense to Owner. Bear expense of making good all Work of Separate Contractors destroyed or damaged by such removal or replacement. Warranty work shall be undertaken at times convenient to the Owner.

C. If work is not remedied within reasonable time, as fixed by written notice from Owner, Owner may correct such condemned Work at expense of Elevator Contractor and withhold such cost from final payment. In event, remainder due is insufficient to cover such cost, Elevator Contractor shall, upon request, reimburse Owner in full for balance.

1.6 WARRANTY MAINTENANCE

A. Provide 12 months of warranty maintenance after date of Substantial Completion. Warranty maintenance shall start co-incidental with one-year warranty.

B. Warranty maintenance shall include emergency minor adjustment callback service shall be available at all times at no extra charge to Owner.

C. Maintenance shall include systematic examination, adjustment and lubrication of all elevator equipment and apparatus, including repair or replacement of electrical and mechanical parts of elevator equipment and apparatus. Repair equipment whenever required and use only genuine standard parts produced and manufactured for equipment concerned.

D. Replace all wire ropes as often as necessary to maintain adequate factor of safety.

E. Renewals or repairs necessitated by reason of misuse, 1 abuse or negligence shall not be included. Repair and/or replacements necessitated by ordinary wear and tear shall be included.

F. Supply all necessary lubricants, cleaning materials, and repair parts required to keep elevators in good working during warranty period.

G. Adequate stock of spare parts shall be maintained locally, and elevator manufacturer and installer shall have men available at such places to ensure fulfillment of service without unreasonable loss of time in reaching job site.

H. Work under this provision shall be performed by personnel under supervision and in direct employ of elevator manufacturer and installer.

I. Maintenance mechanic shall be on site a minimum 8 hours per month to perform preventative maintenance. Preventative maintenance shall be performed during normal working hours of elevator industry.

J. Owner shall have the right to postpone commencement of this warranty period in connection with any specific elevator providing that such is not put into service at time of substantial completion.

1.7 FULL MAINTENANCE PROPOSAL

A. Elevator manufacturer and supplier shall agree to enter into a renewable, full maintenance type of contract.

B. The full maintenance contract shall commence upon the termination of the warranty maintenance and shall cover all elevators supplied for the project.

C. Submit separate price in the Bid Form to furnish complete maintenance for the elevator equipment for the first year of the maintenance contract following completion of the warranty maintenance, based on today's material and labor cost indices and the requirement that the maintenance contract with the Owner will be for a minimum period of five (5) years. Maintenance contract shall include 8 hours per month on preventative maintenance performed during normal working hours of elevator industry.

D. Owner shall pay premium time portion only for callbacks occurring outside of normal working hours of elevator industry.

1.8 TEMPORARY USE OF ELEVATORS

A. Do not use elevators for construction purposes without written authorization from the Owner.

1.9 REQUIREMENTS FOR MAINTENANCE AND OPERATING MANUALS

A. Provide three sets of manuals containing information described below.

B. Description of elevator system's method of operation and control including, but not restricted to, control system, and special or non-standard features provided. Instructions and on-site demonstration for use of elevator control panels, emergency power operation, security system, emergency recall, elevator management and remote monitoring.

C. Legible full-size laminated schematic wiring diagrams stamped as Owner's property covering all electrical equipment as supplied and installed, including all changes made in final work, with all symbols listed corresponding to identity or markings on both machine room and hoistway apparatus.
D. Information on each piece of equipment shall be assembled in the following order:
   1. Equipment details such as:
      a. Approved drawing number.
      b. Model, part and serial number.
      c. Contract number, specification section and clause number.
   2. Maintenance details:
      a. Lubrication chart.
      b. Trouble shooting procedures.
      c. Adjuster's manual.
      d. Wiring diagrams.
      e. Service tool for accessing software and troubleshooting including door operator disable, hoistway learn run, I/O displays, commissioning for encoder replacement and board replacement, adjusting acceleration, deceleration, leveling speed and start time, load weighing and all safety tests.
   3. Spare parts:
      a. List or recommended spares to be kept on site.
      b. List of all special tools and appropriate unique application.
      c. Detail manufacturer and supplier names and addresses.
      d. All equipment is to be listed as to types.
E. Binders shall be approved by Owner before acceptance of installation.
F. All documents other than circuit diagrams, larger than standard size (8 1/2" x 11") paper shall be neatly folded and inserted in labeled envelope. Any photocopies must be totally legible. Only pertinent details shall be acceptable.

1.10 MANUFACTURER'S NAME

A. Manufacturer's name and/or logo shall not appear in any elevator cab, entrance, sill, remote control panel or any other location visible to public.

1.11 INTERIM MAINTENANCE

A. Maintenance for all elevators shall commence on same date. Some units may be turned over for use of Owner before other units, necessitating interim maintenance of such elevators until all units are turned over. Interim maintenance is defined as maintenance provided, from time unit is put into service by Owner, to date when all units are turned over for Owner's use to commence warranty and warranty maintenance. Interim maintenance shall include full maintenance and twenty-four-hour callback service.

1.12 IDENTIFIED, SEPARATE AND ALTERNATE PRICES

A. State in Bid the price carried to provide 12 months of warranty maintenance.
B. State in Bid as a separate price cost to provide monthly interim maintenance on each unit.
C. State in Bid as a separate price cost to provide full maintenance for 1st year of five-year maintenance contract.

1.13 USE OF ELEVATORS FOR CONSTRUCTION PURPOSES

A. Comply with General Contractor's requirements for use of elevators during construction.
B. Construction cars will be provided temporary protection by others.
C. Construction cars shall be subject to interim maintenance.
D. All repairs and/or replacements not covered by interim maintenance which have been made necessary by use of elevator for construction purposes shall be completed on a time and material basis agreement. All repairs shall be completed prior to final acceptance.

PART 2 – PRODUCTS

2.1 APPROVED PRODUCTS AND INSTALLERS

A. Kone, Otis, Schindler and Thyssen are approved installers. Installers must be able to demonstrate their qualifications to supply, install, maintain and service comparable equipment in the downtown Madison area.
B. Kone KCM, Otis GCS, Schindler TXR5 and Thyssen TAC 32T are approved products subject to conformance with specifications.

2.2 ELECTRICAL WIRING

A. Provide complete necessary insulated wiring to connect all parts of equipment. Provide 10% spare conductors.

B. Insulated wiring shall have flame retarding and moisture resisting outer cover and shall be run in metal conduit, metallic tubing or wire ducts.
C. Traveling cables between car and hoistway shall have flame retarding and moisture resisting outer cover. They shall have flame retarding and moisture resisting outer cover. They shall be flexible and shall be suitably suspended to relieve strains in individual conductors. Provide halfway junction boxes on elevators with travel more than 60 feet. Prevent cables from rubbing or chaffing against hoistway or car items.
D. Insulated conductors and conduit or tubing as well as fittings including metal boxes, troughs and ducts shall comply with requirements of Building Code.
E. Provide three shielded pairs of wires and six pairs of unshielded wiring between each elevator controller and respective car stations for future use by Owner.
F. Provide three shielded pairs wires (total of six) from each group of elevators to Security Desk.
G. All spare wires and cables shall be tagged and identified by their destination.

2.3 EMERGENCY TELEPHONE

A. Provide line powered full duplex hands-free telephone in each elevator.
B. Provide minimum 4-inch diameter speaker and microphone and mount 1 behind perforations in a circular pattern in main car station of each elevator.
C. Provide “Push to Call Button” in car station such that when call button is pressed call is automatically placed to Security Desk.
D. Provide engraved signage for CALL PLACED and CALL RECEIVED lights into car station.
E. Provide raised phone symbol and braille tag to left of push to call button.
F. All wiring shall be the responsibility of this section including that between the machine room and the hands-free telephones.
G. The phone shall have the ability to record and play two different voice messages for all elevators.
H. Provide battery backup to operate telephones for at least 4 hours of use.
I. The phones shall be programmable and shall have 4 autodial capabilities. The phone shall employ all progress monitoring to detect whether a call has been successfully placed.

2.4 EMERGENCY RECALL OPERATION

A. Elevators shall be arranged to operate in accordance with Madison Fire Department and Elevator Code. Provide emergency recall switch and Phase 1 indicator light for each group of elevators. Include for alternate floor recall in the event the alarm signal originates from ground floor. Locate fixture in 1st floor hall button of each group of elevators.

2.5 HOISTWAY WORK

A. Coordinate location of sump pits, pit ladders, top of hoistway lighting and pit lighting and light switches with other trades.

2.6 PAINTING

A. Exposed metal work, unless otherwise specified, shall be painted minimum of one coat of rust-inhibiting black paint after installation. Painting shall include fascia and guide rails.

2.7 VOICE ANNUNCIATOR

A. Provide female voice annunciator with adjustable volume to announce floor and direction of travel as elevator stops at each floor.

2.8 EMERGENCY CAB LIGHTING

A. Provide battery powered emergency lighting in accordance with ASME. Emergency light fixture shall consist of 5 LEDs, shall be located in one car station of each elevator and shall be enclosed with a milky white lexan lens and shall provide sufficient illumination around one car station panel. Provide test button in service cabinet for testing emergency lighting unit.

2.9 FASTENERS

A. Provide vandal resistant fasteners on all surfaces exposed to public view unless otherwise specified.

2.10 WORKING PLATFORMS AND LADDERS

A. Provide permanently mounted working platforms and ladders of prime coated steel where distance from the pit floor to underside of plank channels exceeds 83 inches with the car at lowest landing.

2.11 HOISTWAY AND PIT ACCESS

A. Provide hoistway unlocking device in every hoistway door located no more than 6’-11” above finished floor. Provide stainless steel escutcheon tubes and secure with silicone in each door.
B. Provide hoistway access key switches at top floor of each elevator and provide pit access key switches at bottom floor (unless elevators have a walk-in pit). Mount access switches in door jamb without cover plate. Engrave key switch collar with function and UP and DOWN directions. Key switches shall be same type for each elevator.

2.12 ELEVATOR NUMBERING

A. Number all machines, governors, controllers, transformers, disconnects, motor drives, circuit breakers, crossheads and pit equipment with Owner's elevator numbering system.
B. Stencil back of hoistway doors with 4-inch high floor numbers.
C. Provide 3-inch high elevator number plates with black backgrounds and stainless steel characters and braille on one door jamb at each entrance.

2.13 HANDICAP JAMB MARKINGS

A. Provide tactile and braille plates on hoistway door jambs of each elevator. 1 Plates shall have black backgrounds with stainless numbers or letters designating floor level. Plates shall be equal to Entrada type VP2.

2.14 TOP OF CAR LIGHTING

A. Provide two top of car LED light fixtures and locate on either side of car top sheave or hoist rope fastening. One light fixture shall be portable type with a cord of sufficient length to access any part of car top.
B. Provide at least one duplex GFCI receptacle on car top.

2.15 TOP OF CAR INSPECTION

A. Provide fixed top of car inspection unit including up and down buttons, enable button, stop button and guarded toggle switch.

2.16 SECURITY

A. Provide each elevator with three twisted shielded pairs of 20-gauge wires or two RG-6/U co-axial cables as required by security contractor. The wires shall extend from each controller in machine room to the top of each elevator cab. An excess loop of 6 feet of cable shall be provided at each end of cable. All cables shall be isolated from other traveling cables used to carry high voltage alternating current circuits. Provide cutout in each cab ceiling for mounting camera.
B. Provide dedicated single phase 110-volt circuit from machine room to car top of each elevator for camera operation.

2.17 CAB PROTECTIVE PADS

A. Provide one set of cab protective pads for each elevator. Pads shall cover entire side walls and front and rear returns with cutouts for call buttons. Seams shall be double and selvaged. Provide stainless steel pad buttons inside cab of each elevator.

2.18 ELEVATOR CONTROL PANEL

A. Provide stainless steel elevator control panel in Fire Command Center at 1st floor. Incorporate the following features into control panel for each elevator.
   1. Digital position indicators and direction arrows for each elevator. Position indicators shall be at least 1 ¼ inches high.
   2. Fire service recall key switch for each group of elevators.
   3. Interlocked push buttons for Elevator Nos. 1 and 2, Elevator Nos. 3 and 4 so that only one elevator per group can be re-selected to operate off of emergency power.
   4. Up and down direction arrows.
   5. Phase 1 indicator lights.
   6. Phase 2 indicator lights.
   7. Emergency power light for each group of elevators.

2.19 STANDBY POWER OPERATION

A. One elevator from each group (total of 2) shall start up automatically and return to ground floor at full rated speed. For each group, all elevators in service shall return to the ground floor one at a time. When each elevator reaches the ground floor, it shall shut down and park with its doors open. All cars will have sufficient emergency power, until they are shut down, for alarm, lighting and exhaust fan. Provide interlocked-type manual reselection buttons which will permit operation of selected elevator at any time.
B. Cars on independent service shall sound buzzer and return to ground lobby.
C. Cars parked at ground floor with doors closed shall open their doors.
D. Flight times and express trip times shall comply with specified performances.
E. Car which is on "independent service" shall not be designated as car left in service.
F. Cars shall be sequentially lowered to ground floor.
G. Cars with doors blocked open shall sound continuous buzzer.
H. Should elevator fail to respond and return to main level after adjustable period of time initially set at 20 seconds, it shall be by-passed and next car returned to ground floor.
I. Provide standby power LED jewel in 1st floor hall fixture of each group of elevators.

PART 3 – EXECUTION

3.1 NOT USED

END OF SECTION

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SECTION 14 21 00
TRACTION ELEVATORS

PART 1 – GENERAL

1.1 SUMMARY

A. Comply with Section 14 20 50, General Elevator Requirements and with Sections of Division 1.
B. Provide all materials, products, equipment, services and labor to complete work as specified herein.

1.2 SYSTEM DESCRIPTION

A. Elevator Nos. 1 and 2 (West Parking Garage)

1. Type:	Two Basement Geared Passengers
2. Capacity:	3,500 pounds
3. Speed:	350 FPM
4. Levels Served:	U5 to U0, 1 and 2
5. Stops and Openings:	8 stops in line
6. Operation:	Microprocessor Group
7. Dispatch Floor:	1st Floor
8. Platform Dimensions:	8’-0” wide by 6’-2” deep
9. Car Interior Dimensions:	7’-8” wide by 5’-5” deep
10. Control:	ACVF

11. Hoistway Entrances:	4'-0" wide by 7'-0" high
12. Hoistway Dimensions:	9'-4" wide by 7'-10" deep
13. Clear Overhead:	17'-0"
14. Pit Depth:	5'-6"

B. Elevator Nos. 3 and 4 (East Parking Garage)

1. Type:	Two Basement Geared Passengers
2. Capacity:	3,500 pounds
3. Speed:	350 FPM
4. Levels Served:	U5 to U1 and 1
5. Stops and Openings:	6 stops in line
6. Operation:	Microprocessor Group
7. Dispatch Floor:	1st Floor
8. Platform Dimensions:	8'-0" wide by 6'-2" deep
9. Car Interior Dimensions:	7'-8" wide by 5'-5" deep
10. Control:	ACVF
11. Hoistway Entrances:	3'-6" wide by 7'-0" high
12. Hoistway Dimensions:	9'-4" wide by 7'-10" deep
13. Clear Overhead:	17'-0"
14. Pit Depth:	5'-6"

1.3 PERFORMANCE

A. Elevators shall travel at specified rated speed within maximum variation of 3%, regardless of load or direction of travel.

B. Performance time is elapsed time measured from start of door close on one floor until car is level and doors are 3/4 open at an adjacent typical floor. Performance time shall be:

1. Elevator Nos.1 to 4 9.0 seconds

C. Flight time is the elapsed time from car start to car stop time between adjacent typical floors. Flight time shall be:

1. Elevator Nos. 1 to 4 5.0 seconds

D. Acceleration component of side to side or front to back sway, measured by Bruel and Kjaer Model 2511 accelerometer or approved manufacturer, shall not exceed:

1. All Elevators 25 millig's peak to peak at rated speed

E. Maximum noise level from machine to any occupied space including car cab shall not exceed 60 dbA and shall be free of any pure tone elevator transmitted noises. A pure tone shall be when any one third octave band sound level exceeds adjacent one third band by 3dB.

F. Acceleration rate shall not exceed 4 feet per second per second and change in acceleration shall not exceed 8 feet per second cubed.

G. Door open time shall be adjustable and shall be initially set at:

1. Elevator Nos. 1 to 4 1.7 seconds

H. Door close time shall be adjustable and shall be initially set at:

1. Elevator Nos. 1 to 4 2.7 seconds

I. Dwell times for car calls shall be individually adjustable and shall be initially set at:

1. Elevator Nos. 1 to 4 3.0 seconds

J. Dwell times for hall calls shall be individually adjustable and shall be initially set at:

1. Elevator Nos. 1 to 4 5.0 seconds

K. Nudging time shall be adjustable and shall be initially set at 30.0 seconds.

L. Adjust door operation so that the increase of noise level over the ambient noise (assume 40 dbA minimum) does not exceed 4 decibels when measured at 5 feet in front of the entrance, at any time during the full door open and door close cycle and reversal cycle. Measure the noise level using ANSI type-2 sound level meter on the "A" scale.

M. Leveling shall be accurate to within 1/8 inch.

PART 2 – PRODUCTS

2.1 GUIDE RAILS

A. Provide accurately machined standard T section guide rails with tongued and grooved joints for car and counterweight weighing not less than specified by Code. Substantial machined fish plates shall be used for rail joints. Back of rail shall be machined where it is in contact with fish plate. Rail joints shall be smooth.

Guide rails shall be supported and placed so not to become distorted by eccentric loading. Properly align rails.

B. Provide sliding rail clips so as to limit maximum vertical force due to building compression. Properly align vertical force due to building compression. Properly align each car and counterweight rail to provide for ride characteristics within the maximum acceleration rates as specified.

C. Bracket spacing shall correspond to support locations shown on Drawings.

D. Minimum size of car guide rails shall be 15 pounds per foot and minimum size of counterweight guide rails shall be 12 pounds per foot so rails can span a height of 14'-0".

2.2 BUFFERS

A. Provide oil buffers for car and counterweight and provide permanently buffer data plates and provide dated test tags. If required provide stands and extensions to accommodate pit depths shown on Drawings.

B. Provide a minimum counterweight run-by of at least six inches. Provide at least 12 inches of blocking under each counterweight to facilitate rope shortenings.

2.3 PIT EQUIPMENT

A. Provide governor tension sheaves and compensating tension sheaves. Provide a minimum of 12-inches clearance under each tension sheave.

B. Provide pit stop switches to comply with ASME.

C. Provide limit switches to comply with ASME.

D. Locate junction boxes and troughing to allow for installation of pit ladders.

E. Provide maximum counterweight run-by sign in each pit.

2.4 MACHINE ROOM

A. Machines, controllers and transformers shall be located in respective machine rooms located as shown on Drawings. Governors shall be located in top of each hoistway and shall be resettable from respective machine room.

B. Seal all machine room floor sleeves to inhibit noise transmission into hoistway. Maximum noise level from machine room to any occupied space including car cab shall not exceed 60 dbA.

C. Locate front of controllers so that motor starters are visible from respective fused main line disconnect.

2.5 GEARED MACHINES

A. Provide worm and gear traction machine with motor, brake, gearing, deflector sheave and driving sheave mounted on steel bedplate. Bedplate shall be isolated from building structure with elastomer pads. Machine shall be equal to Hollister Whitney type 64BS subject to compliance with specifications.

B. The worm shall be of higher grade steel, integral with the worm shaft and provided with a ball bearing thrust unit designed to absorb the thrust of the worm in both directions.

C. Thrust shall be removable without dismantling machine.

D. Motor shall be reversible type, designed for elevator service. Motor shall be provided with high starting torque and low starting current. Motor shall have sufficient horsepower to drive elevator, under full load conditions and meet specified performance time and operate at a minimum of 180 starts per hour without overstressing motor.

E. The worm gear shall be hobbed from a bronze rim which shall be accurately fastened to gear spider.

F. Brake shall be direct current operated, electrically released, spring applied and shall be capable of stopping and holding car securely with load of 125% of rated capacity.

G. The roller metal bearings shall include adequate means for lubrication.

H. Provide brake switch so car cannot run until brakes are lifted.

I. Guard hoist ropes outside footprint of bedplate.

J. Provide overhead sheave beams, isolation pads and sheaves at top of each hoistway to guide hoist ropes down to car and counterweight.

K. Provide inspection cover in machine to view worm and gear.

2.6 CONTROLLERS

A. Provide closed loop motor control feedback system which automatically regulates motor drive by comparing actual acceleration, deceleration and velocity profiles with preset values. Provide tachometers and position encoders for accurately measuring speed and position of elevator.

B. Enclose all controls in steel cabinet with swing door and adequate ventilation apertures and exhaust fans. Isolate controllers to prevent transmission of structural born vibration to other parts of building.

C. Provide solid copper ground as necessary to isolate new controllers from electrical interference and to isolate building equipment from radio frequency interference.

D. Pre-torque motor so that elevator can start as soon as doors are closed and locked. Start time shall not exceed 0.3 seconds.

E. In the event of a malfunction, elevator controller shall attempt to restart and run elevator. If after third attempt elevator fails to run or run continuously, it shall be brought to nearest floor, open its doors and shut itself down. Only a continuous interruption of safety circuit shall prevent elevator from returning to the nearest floor.
F. Provide advanced door opening so that doors can begin to open as soon as elevator enters leveling zone.
G. Controllers shall be rated at 180 starts per hour.

2.7 MOTOR DRIVES

A. Provide solid state digitally controlled motor drive with isolation transformer and noise filter to convert main AC supply into variable voltage AC supply for hoisting motor operation. Provide automatic closed loop system providing instant and noiseless response to power requirements. Filter converted power to provide highly regulated, ripple-free, stepless speed control for producing smooth performance and accurate floor landings. Non- regenerative drives are prohibited.
B. Provide resistors to burn off regenerative power created by overhauling load or regenerative braking conditions.
C. Size motor drive to handle full starting current plus 10%. Protect against voltage spikes. Motor drive shall continue to perform under conditions of fluctuations in voltage line supply of +6% and frequency variations of +2% from normal values without any degradation to normal elevator service.
D. Provide two independent means for removing power from hoist motor. One shall be contactors in series with both sides of armature and second means shall be thyristors. Contactors shall open each time car stops. Brake shall be applied while contactors are dropped out.
E. Continuously monitor armature voltage while elevator is in leveling mode.
F. Motor drive unit shall be capable of detection and reacting in safe mode to loss of supply voltage, loss of phase, loss of fuse, and/or excessive heating or short circuits in either machine or motor drive. Automatically re-start equipment which has stopped due to AC power failure.
G. Design solid state motor drive to handle current in excess of rated amount without damage to controllers and machines.
H. Isolate all solid-state motor drive equipment with elastomer pads with a minimum static deflection of 3/8 inch to prevent vibration transmission to building structure.
I. Elevator motor drive shall be sized to accommodate size of disconnects and feeders shown on Drawings.
J. Equipment manufacturer shall provide a written statement confirming that the total current harmonic distortion contribution from the equipment is less than 5% and individual harmonic distortion is less than 3%. Provide harmonic filters as necessary to meet these conditions.
K. Motor drives shall be rated at 180 starts per hour.

2.8 AUTOMATIC LEVELING DEVICE

A. Provide self-leveling device to maintain car leveling accuracy within 1/8 inch of landing floor irrespective of load. This device shall automatically and independently of other devices correct over-travel and rope stretch.

2.9 SAFETY DEVICES

A. Provide car safety devices mounted on underside of platform. Devices shall be equipped with switch to cut off motor power and apply brake prior to actual setting of safety grips. Safety grips shall be automatic reset type.
B. Provide car governors including tripping switches, governor ropes and tension sheaves. Provide minimum 12-inch clearance underneath each governor tension sheave.
C. Provide double brake or rope gripper to prevent unintended movement away from floor with both car and hoistway doors open and overspeed in up direction.

2.10 COUNTERWEIGHT

A. Provide counterweight consisting of steel weights set in structural steel frame. Counterweight shall be equal to complete elevator cab plus approximately 45% (± 50 pounds) of rated capacity. Secure counterweight brick to prevent rattling during car travel.
B. Provide pit guard on all open sides of counterweight.
C. Provide at least 12 inches of blocking under each counterweight to eliminate need to shorten hoist ropes.

2.11 CAR AND COUNTERWEIGHT GUIDES

A. Provide spring loaded roller guides for car and counterweight, mounted at top and bottom of car frame.
B. Spring loaded roller guides shall consist of tired wheels of a durable, resilient material maintained in uniform contact with three finished rail surfaces and operate on dry, unlubricated surfaces. Use polyurethane or other roller tire material which will not develop flat spots after standing idle for 24 hours under normal environmental conditions. Provide roller guides of sufficient diameter to restrict wheel diameter to a maximum of 500 for cars and a maximum of 1000 for counterweights except minimum diameter shall be 6 inches for car and 3 inches for counterweight.

C. Statically balance car and counterweight so that maximum pressure on any roller guide member shall not exceed 50 pounds.

2.12 TRACTION (HOIST) ROPES

A. Provide traction steel hoisting ropes of sufficient size and number to ensure proper traction quality. Hoist ropes provided for any car shall be from same factory run and shall be suitably protected from rust and corrosion. Provide wedge clamp rope sockets for fastening ropes to car and counterweight. Provide dated rope installation tag on car top. Provide shackle springs on car or counterweight end.

B. Provide wedge clamp sockets for fastening to car and counterweight. Hobble sockets at each end to prevent spin out.

C. Provide shackle springs on counterweight end of hoist ropes.

D. Equalize tension in hoist ropes and install dated hoist rope tag on car end.

2.13 COMPENSATING ROPES

A. Provide if necessary Whisperflex compensation with pit mounted roller guides.

2.14 HOISTWAY ENTRANCES, FRAMES AND SILLS

A. Passenger elevators shall have single speed center opening doors giving clear opening as specified and service elevator shall have two side opening doors giving clear opening as specified.

B. Doors and sight guards shall be formed from not less than 16-gauge furniture grade sheet steel, both front and hoistway side sheet steel panels shall be flush and separated by suitable steel reinforcing. Doors edges shall be finished smooth. Single panel steel doors are not acceptable. Provide bottom of doors with proper guides (minimum two per door panel) of composite material reinforced with steel to operate in sill slots with minimum clearance. Guides shall allow for lateral adjustment in both directions. Felt wrapped gibs are not acceptable. Top of doors shall be reinforced and be capable of carrying weight of door and hanger pendant bolts.

C. Provide black rubber astragals to leading edge of center opening doors.

D. Provide black painted struts and headers to support doors. Provide rubber stops on struts to cushion doors should they over travel full door open by 3/8 inch or more.

E. Hoistway door operation shall be smooth at all times. Design 1 all door equipment to operate with minimum of noise.

F. Hoistway doors and sight guards shall be finished in No. 4 stainless steel at all floors.

G. Entrance frames shall be of hollow metal construction, minimum 14-gauge sheet steel with sound deadening material applied to back surface and designed for three or field bolted construction. Frames shall match finish of hoistway doors.

H. Entrance frames and doors shall be labeled 1-½ hour fire rating, having certificate approved by Code. Permanently fasten certificates to doors. Stick-on certificates are not acceptable. Related door hardware such as interlock and associated wiring shall be capable of operating at least one-hour subject to UL fire test.

I. Set entrance frames in alignment with elevator cab platform. Fasten struts and headers to structural supports and secure to building walls by substantial ties. Set frames in place prior to building walls.

J. Provide matching cab interior and hall landing sills having recessed slots to receive door guides. Install sills to allow for lobby floor finishes. Provide steel angles and fasten securely to building structure. Provide sills with adjustable screws to delete need for grouting sills in place. Car sills shall be set to accommodate finished flooring in cab. All sill fastenings shall be concealed. All sills shall be of extruded aluminum construction.

K. Provide fascia extending from top of hanger to sill above for every floor served or passed. Fascia shall not be less than 16-gauge sheet steel. Fascia shall be properly reinforced and provided with necessary supports and fastenings to secure in place. After installation, paint fascia with one coat of rust inhibiting black paint. Dust covers are prohibited.

2.15 CAR AND HOISTWAY DOOR HARDWARE

A. Provide hanger and track assemblies for each hoistway door and car door. Tracks shall be steel with working surface contoured to match door rollers. Hangers shall be designed for power operation and have provisions for vertical and lateral adjustment. Hangers shall have two-point suspensions for each door panel. Door hanger rollers shall be steel with polyurethane tires or suitable non-metallic sound reducing material.

B. Provide weighted door closers (steel weight traveling within PVC pipe) or spirators to ensure doors are self-closing.

C. Provide up-thrust eccentric (minimum two per panel) and adjust to within 1/32 inch of bottom of track.

D. Provide relating cord and sheaves to connect center opening doors or two speed doors.

E. Provide pick up rollers on back of hoistway door to engage car door clutch Adjust rollers so they engage clutch by at least half the thickness of door rollers.

F. Provide rated interlock assembly designed to prevent movement of car until car doors are within ½ inch of fully closed and hoistway doors are locked both mechanically and electrically. Adjust interlocks so there is no metal to metal contact. ECI interlocks are prohibited.

G. Provide steel contoured car door tracks, eccentrics, relating cords, hangers and rollers as specified for hoistways doors. Provide mechanical gate switch which shall make up when car doors are within ½ inch of fully closed position.

2.16 DOOR OPERATORS

A. Provide direct current closed loop door operators to open and close car and hoistway doors simultaneously, quietly and smoothly. Doors shall be capable of opening automatically when car is leveling at respective landings and shall close after an adjustable interval. Door movements shall be cushioned and checked at both limits. Car doors shall be readily operated by hand from within in event of power interruption and if elevator is within unlocking zone.

B. Provide car door clutch on each elevator. Door clutch shall engage pick up rollers by at least ½ the depth of the pickup rollers.

C. Provide encoder on motor to provide closed loop motor control to measure both speed and position. Motor torque shall be automatically varied to overcome stack effect. Motor shall be sized to meet specified performance times and door times.

D. Door open time and door close time shall be adjustable and initially set at times specified.

E. After stop is made, doors shall remain open (dwell) for an adjustable interval. Door dwell time shall be adjustable for both car and hall landing calls and shall be initially set at times specified.

F. Provide “Door Open” button in car. Pressure on “Door Open” button shall re-open doors.

G. Provide “Door Close” button in car. Pressure on “Door Close” button shall cause doors to close immediately, but doors must remain fully open for at least 1.0 second when answering a car call and at least 2.0 seconds when answering a hall call. Interruption of infrared door reopening devices shall not affect dwell timing.

H. Door operator and components shall be specifically designed to minimize noise as specified.

I. Provide door restrictors to prevent opening of car doors more than 4 inches when car is outside unlocking zone. Door operators shall be equal to GAL MOVFR, Kone AMD Heavy Duty, Otis Glide, Schindler QKS 15 and Thyssen HD04 subject to compliance with specifications.

2.17 DOOR PROTECTION DEVICES

A. Provide solid state detector device consisting of at least 36 infrared rays reflected across car entrance. Detector shall be arranged to immediately stop and reverse car and hoistway doors when object interrupts infrared rays. Door detectors shall be equal to T. L. Jones Microscan E, ICU 47, Janus Panaforty and Otis Optiguard subject to compliance with specifications.

B. If doors are prevented from closing for adjustable period (initially set at times specified) by operation of protective and/or detector devices, doors shall close at reduced speed independent of door protection devices. Under this condition, loud warning buzzer, located in car, shall sound.

2.18 LANDING BUTTON FIXTURES

A. Provide one hall button riser consisting of cover plates with concealed fasteners, call buttons and back boxes for each group of elevators. Back boxes at designated landing shall be sized to standby power light.

B. Provide stainless steel cover plates with concealed fasteners.

C. Provide hall buttons equal to Innovation type PB35.

D. Provide blue LED registration lights.

E. Provide emergency power indicator light in each 1st floor hall button fixture.

2.19 DIRECTION LANTERNS

A. Provide hall direction lanterns consisting of back boxes, 2.5-inch diameter flush mounted milky white lexan disks and stainless steel cover plates with concealed fasteners beside each entrance of each passenger elevator. Provide cluster type LED lights illuminating white for up travel and red for down travel. Provide electronic dual stroke gongs with adjustable volume which shall sound once for up travel and twice for down travel.

B. Lantern shall illuminate and sound gong at least 4.0 seconds prior to car arrival. Lantern shall stay illuminated until doors are closed.

C. Lanterns shall be self-locking type designed to prevent slippage due to building vibration and shall be readily accessible for maintenance.

D. Provide baffle between up and down lanterns to prevent light from bleeding through lens in opposite direction.

2.20 CAR FRAME AND PLATFORM

A. Provide car frame consisting of structural steel uprights, crosshead and safety channels securely bolted together. Frame shall be reinforced and braced to relieve car enclosure of undue strains.

B. Provide eccentric type cab steadier plates to ensure cab can float freely within sling.
C. Provide car platform and subfloor consisting of sound isolating type with rubber isolation pads on auxiliary steel frame fastened to car frame. Platform shall be suitably reinforced with necessary steel stringers and shall be designed to accommodate Class A loading. Subfloor shall consist of two 1/2 inch layers of marine grade plywood.
D. Provide TM switches on car tops.
E. Provide rope jump guards on car and counterweight 2:1 sheaves.

2.21 CAR OPERATING STATIONS

A. Provide two full swing return type car stations in each passenger elevator. The following flush mounted devices shall be pierced into returns. Locate uppermost car call button 48 inches above finished floor.
1. Car call buttons with blue LED registration lights corresponding to each level served. Registration of car call shall cause corresponding light to illuminate. When call is answered call shall cancel and light extinguish.
2. Emergency alarm button.
3. Door open button and door close button.
4. Perforated telephone grille with speaker, microphone, and call answered lights and push to call button.
5. Phase 1 indicator light.
6. Window for displaying elevator license.

B. Button style shall match hall buttons. Provide to the left of 1 each button raised alphanumeric handicapped characters and braille to indicate floor marking and button operation. Markings shall be flange mounted and shall be equal to Innovation type Oval Surround.
C. Car shall have lockable key operated service cabinet located below and flush with car station. Cabinet faceplate finish shall match operating panel and be equipped with concealed hinge. Cabinet shall contain following switches:
1. Independent service key switch with key removable in both positions.
2. Three speed fan key switch.
3. Car light key switch.
4. Any other key switches or devices required to service elevator.
5. Duplex GFCI receptacle.
6. Test button for testing emergency lighting unit.
7. Inspection key switch.

D. Provide engraved capacity and elevator number onto car stations. Back fill engraving with black paint.
E. Provide stainless steel cabinet for housing fireman's service including door open and close buttons, call cancel button, phase 2 key switch, phase 2 indicator light and phase 2 signage. Engrave door in red with FIRE OPERATION.

2.22 CAR ENCLOSURE

A. Provide car enclosure fabricated with sheet steel, minimum 14 gauge, designed to support cab finishes. Overall cab height shall be 8'-0".
B. Provide stainless steel swing front returns, car door jambs, car doors and transoms. Car doors shall be constructed of two panels of sheet steel, minimum 16 gauge with suitable reinforcing between each panel.
C. Provide cab finish allowance of $65,000 per elevator for finishes to side and rear walls, suspended ceiling and lighting and handrails.
D. Provide weight allowance of 1,500 pounds for cab finishes and finished flooring.
E. Provide sheet steel canopy, minimum 14 gauge, finished in eggshell white baked enamel.
F. Provide three speed squirrel cage exhaust fan for cab ventilation and mount in car ceiling. Provide stainless steel grille over fan in ceiling. Noise level shall not exceed 60 dbA when fan is on high speed. Air shall be displaced at a minimum rate of 350 cfm. Fan shall be equal to Man D Tec type OE.
G. Provide ventilation apertures in car enclosure to comply with code.
H. Provide top of car emergency exit in canopy. Provide top of car exit switches.
I. Provide rubber astragals on center opening car doors.
J. Provide recess in subfloor to accommodate finished flooring.

2.23 POSITION INDICATOR

A. Provide red colored LED digital car position indicators located in each car station. Indicators shall be a minimum of 2 inches high and shall be sufficiently bright enough to be readily visible under normal ambient lighting conditions within car.
B. Position indicator shall constantly show position of elevator.

2.24 ALARM BELL

A. Provide electric signal bell located on car top and in hoistway at 1st floor. Bells shall be connected to the alarm button in car. Pressing this button shall cause bells to ring.

2.25 KEY SWITCHES

A. Cab exterior key switches, except where contrary to Code, shall be manufacturer's standard type key switches. Engrave key switches to indicate each position (on/off) and function.

2.26 MICROPROCESSOR GROUP – GENERAL

A. Provide EEPROM or EPROM microprocessor-based group supervisory control system. Microcomputer and accompanying software programs shall be specifically designed to coordinate and control individual and group elevator activities at all times within building. Provide system with a minimum of two dispatching computers in case one goes down.

B. Provide system with solid state devices which shall not be affected by electrical noise caused by switching and operation of other electrical equipment. Equipment shall be capable of problem-free operation within ambient temperature ranges as specified by Code.

C. Microcomputer shall be housed within free-standing or wall-mounted control enclosure located in elevator machine room. Enclosures shall be designed to accommodate compartmentalized units. Provide adequate means of ventilation and filtration of air into controller enclosures. Provide swing doors to access group and car control enclosures.

D. Printed circuit cards shall be readily removable and interchangeable where cards perform identical functions. All cards shall be electrically interlocked and mechanically keyed to ensure proper seating. Card terminal assemblies shall be plug-in to easily remove and replace without disturbing conductor wiring.

E. Provide minimum 16 bit microprocessor with sufficient read only memory storage for all necessary operation and control programs plus 25% spare capacity for future program expansion. Software based programs shall be readily changeable without undue disruption in service. Protect all program memories against loss due to power failure.

F. System shall incorporate necessary interfaces to allow for connection of portable service and maintenance service equipment. Interface shall allow for recording of system performances and be compatible with acoustical coupling devices for remote site monitoring of performance. Recording devices shall be capable of a direct connection without wiring changes.

G. System shall be provided with complete self-diagnostic capabilities including telephone modem for computerized monitoring of elevator alarms, system failures, performance, etc. by elevator maintenance contractor.

H. Microprocessor based control system shall calculate car assignments based on real-time response in reply to current traffic conditions in selecting and assigning cars (based on their availability and present status) to answer landing calls. System shall monitor series of car activity and status data prior to initiating car assignment to a particular landing call. These parameters shall be constantly assessed assesses, minimum five times per seconds. The following parameters shall be monitored as a minimum.

1. Car position, direction, velocity.
2. Motor power status.
3. Previous car assignments.
4. Car door position.
5. Existing car calls.
6. Car load.
7. Main lobby status.
8. Coincident call.
9. Double lobbies.

2.27 MICROPROCESSOR GROUP – FEATURES

A. Provide each elevator with following operational and control features as specified below:

1. Provide at least two load weighing transducers to measure live load in car. Transducers must be capable of measuring an evenly distributed load within +/-100 pounds. They shall be used in conjunction with the following control features:
   a. Provide load weighing to dispatch car ahead of operating intervals once it is filled to an adjustable percentage of rated capacity. Load weighing dispatch shall be initially set at 60% of rated capacity.
   b. Provide load weighing to bypass hall calls in event car becomes and/or remains filled to an adjustable percentage of rated capacity. Load weighing bypass shall be initially set at 70% of rated capacity.
   c. Provide anti-nuisance service which automatically cancels registered car calls when an adjustable number of registered car calls exceed an adjustable load in the car. Anti-nuisance shall be initially set at 4 registered calls and a load of 300 pounds or less.

d. Pre-torque elevator machine to reduce start time to 0.3 seconds or less.

2. When car arrives at terminal floor all previously registered car calls shall be automatically canceled or when car reverses direction all previously registered car calls shall be automatically canceled.
3. Provide directional reversal so that car, arriving at landing where both up and down hall calls are registered, will first answer call placed for direction that car was originally traveling. If no car call is placed in initial direction and car is assigned to respond to opposite direction landing call, car doors shall close and immediately re-open to respond to opposite direction landing call. Hall lantern operation shall always correspond to intended direction of elevator travel.
4. Provide reversal feature, which will allow car to automatically stop at next floor, and reverse without opening its doors, upon assignment of opposite direction landing call when changing traffic conditions have canceled previous hall call assignments. When 1 car stops at floor for reassignment, hall lantern shall not illuminate.
5. Provide dispatch protection to ensure auxiliary means of dispatching that will automatically be initiated when normal dispatching fails.
6. Provide controls that will designate only one car as "next up" at ground floor. Only designated car shall illuminate lantern and open its doors. Cars returning to ground floor without registered ground floor car call and not designated "next up" shall not open their doors, nor illuminate their lanterns until designated as "next up". During periods of heavy up peak traffic, two cars may be simultaneously designated as "next up".
7. Provide independent service feature which will allow individual car to be withdrawn from group operation and operate in response to car calls only. Independent service shall be controlled by two-position key switch mounted in each car's service cabinet, key shall be removable in both positions. Registered car calls shall be capable of cancellation by turning key switch to "OFF" position. Independent service switch shall only take car out of group operation when switch is turned to "ON" position.
8. Provide high call-low call reversal so that all cars shall be capable of making high call-low call reversals without having to travel to terminal floor, except to answer landing call or car call at that level.
9. Provide advance selection feature to illuminate appropriate hall lanterns and sound gong of car selected as "next up" when no selected car is at ground floor. Advance timing shall be adjustable and initially set for 5.0 seconds.
10. All landing calls shall be timed. Any landing call which exists for longer than adjustable time limit shall receive priority service.
11. Provide car call cancellation feature so that calls placed behind direction of travel will automatically cancel upon direction reversal.

2.28 MICROPROCESSOR GROUP – TRAFFIC PROGRAMS

A. Once car has been assigned landing call, it shall proceed to answer call. Supervisory system shall continuously evaluate operation state of that, and every other car, and be capable of re-assigning landing calls up until assigned car commences deceleration to answer particular call. If "assigned car" becomes delayed, supervisory system shall automatically assign landing call to next most suitable car.

B. Supervisory system shall anticipate traffic in certain sectors of building and position free or non-assigned cars at these floors accordingly.

C. Up-peak traffic program shall operate as follows:

1. Up traffic mode of operation shall be activated by adjustable time clock and monitoring of car calls registered and car load measured at 1st floor. Clock device shall initiate up peak mode of traffic in anticipation of morning inrush traffic. Up peak mode shall be maintained by measuring ground floor landing calls, car loading at ground floor, and subsequent car calls registered in departing up traveling cars.
2. During up peak mode of operation, minimum of one car shall always be assigned to ground floor. Cars, upon answering their car calls, shall travel non-stop to ground floor.
3. Up direction and down direction landing calls placed above ground floor shall be answered in efficient and prompt manner.
4. System shall be designed to automatically monitor and dispatch cars away from ground floor so as to prevent "bunching" of cars.
5. Group supervisory control system shall constantly monitor elevator performance and traffic demands and be capable of automatically shifting after expiration of up peak time clock and adjustable time delay, into normal operating mode when traffic ceases to be predominantly up in direction and/or significantly lighter in volume.

D. Down peak program shall operate as follows:

1. When "down" traffic reaches pre-determined level, elevators shall be placed into down peak mode of operation. Down traffic peak shall be measured by continually scanning number of unanswered down landing calls registered above ground floor as well as exiting car load at ground floor.
2. During down peak mode, system shall automatically dispatch cars up from ground floor. Cars shall be assigned to answer either groups of down landing calls, or landing calls registered within specific building zones, as determined by supervisory system. System shall evenly distribute or cycle cars to service all building floor levels in order to provide consistent levels of service.
3. Up landing calls shall be assigned in prompt and efficient manner.
4. Group supervisory computer shall constantly monitor predominance of 1 down direction traffic. System will automatically shift into normal operating mode, after an adjustable time delay, once traffic ceases to be predominantly down and/or significantly light in volume.
5. Priority shall be given to landing calls exceeding a specified long waiting time (initially set at 60 seconds) by bypassing calls of a short duration.

E. Two-way traffic program shall operate as follows:
1. During periods of two-way traffic, each landing call shall be assigned to car best able to respond to registered call. Control system shall bias assignments of landing calls to cars having identical car calls and whose direction of travel corresponds to registered landing calls (i.e., co-incident calls).
2. System shall automatically select and maintain appropriate ground floor bias depending upon upward bound traffic measured. System may automatically assign one car to park at ground floor provided down direction traffic conditions warrant.

F. Off-peak traffic program shall operate as follows:
1. During periods of light or off-peak traffic each landing call shall be assigned to car best able to answer particular call. Unassigned cars shall be directed to park in pre-designated zones in anticipation of future traffic demands or at last level served. System shall ensure sufficient numbers of elevators are in operation to provide satisfactory service to building at all times.
2. One elevator shall always be assigned to park at ground floor. This car shall be designated "next up". Consequentially its doors shall be open and its lantern or hall signal fixture shall be illuminated. Once this car has left ground floor in response to car calls, system shall assign another car to ground floor.
3. Preference shall be given to a running car.

2.29 SIMPLEX OPERATION

A. When a car starts upward in response to one or more car or up landing calls, it shall stop at all floors for which car or up landing call is registered. Stops shall be made in order in which floors are reached, irrespective of order in which calls were registered, provided button for given floor is registered sufficiently in advance of arrival of car to permit stop to be made. Down landing calls shall have no effect during upward movement of car, except that car shall stop in answer to highest down call when it automatically reverses and proceeds downward answering car or down landing calls in a similar manner.

B. Fan and lights shall be provided with an independent power circuit.

C. Provide car cancellation feature such that calls placed behind the direction of travel cannot be registered or will automatically cancel upon direction reversal.

D. Provide independent service feature which will allow individual car to be withdrawn from group operation and operate in response to car calls only. Independent service shall be controlled by two position key switch mounted in the car's service cabinet; key shall be removable in both positions. Registered car calls shall be capable of cancellation by turning key switch to "OFF" position. Independent service switch shall only take car out of group operation when switch is turned to "ON" position.

E. Elevator shall park at last floor served.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Equipment Arrangement
1. Arrange equipment in machine room so that equipment can be removed for repairs or replacement without dismantling or removing other equipment components.
2. Accommodate equipment in space provided.
3. Verify dimensions of hoistways and machine rooms before starting work.

B. Guide Rails and Brackets
1. Ensure guide rails are plumb and parallel within maximum deviation of 1/32”. Cut off guide rails that are pinching against top of hoistway.
2. Use metal shims only and provide lock washers under all nuts and tap bolts.

3. Compensate for expansion and contraction of guide rails and building compression.
4. Clean running surface of guide rails prior to final acceptance.
5. In concrete structures, supply and install all necessary inserts after coordination with formwork contractor or provide self-drilling expansion shelf bolt anchors for support of brackets. Where Architect considers any concrete fastener improperly installed, either replace fastener or demonstrate stability of fastener by performing on-site test under 1 which fastener is subjected to four times manufacturer's safe pullout or working load.
6. Include steel reinforcement and backing for car and counterweight guide rails where necessary.

C. Touch-up
1. Prior to Substantial Completion, touch-up and restore to new condition damaged or defaced factory finished surfaces.
2. Remove protective coverings and clean exposed surfaces after completion and leave in first class condition.
3. Paint controller room floors.
4. Completely clean down hoistways including headers, sills and supports, car tops, counterweights, sheaves, roller guide assemblies and pit equipment. Paint car tops.

D. Entrances and Car Enclosures
1. Set entrances in alignment with car openings and plumb with hoistway lines.
2. Erect elevator enclosures in accordance with Code requirements.

3.2 QUALITY CONTROL

A. Testing
1. Perform and meet tests required by ASME, plus State of Wisconsin including witnessing of all safety tests.
2. Supply instruments and carry out performance checks of all equipment, including group supervisory control and operation systems. Performance check shall be done in presence of Owner. Notify Owner in writing, at least one week prior to date of performance and operational inspection.
3. Submit test and approval certificates required by jurisdictional authorities.
4. Provide operator to run car for inspection of elevator equipment in hoistway by Owner. Provide operator for follow-up re-inspection. Elevator contractor shall be held responsible for the additional cost incurred by Consultant of subsequent re-inspections not completed after initial re-inspection.
5. Perform full load overspeed car safety tests, buffer tests and 125% rated load brake test. Spin test and seal governors. Install dated test tags.
6. Comply with OSHA guidelines and Elevator Field Employees Safety Handbook.
7. Provide accelerometer and noise graphs for each elevator by running car from bottom to top and then top to bottom. Graphs shall indicate maximum vibration in each axis and maximum noise level.

END OF SECTION